NORTH AMERICAN AVIATION, Inc.
Engineering Library

FLIGHT

and AIRCRAFT ENGINEER

1/-

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

APRIL 29th, 1943

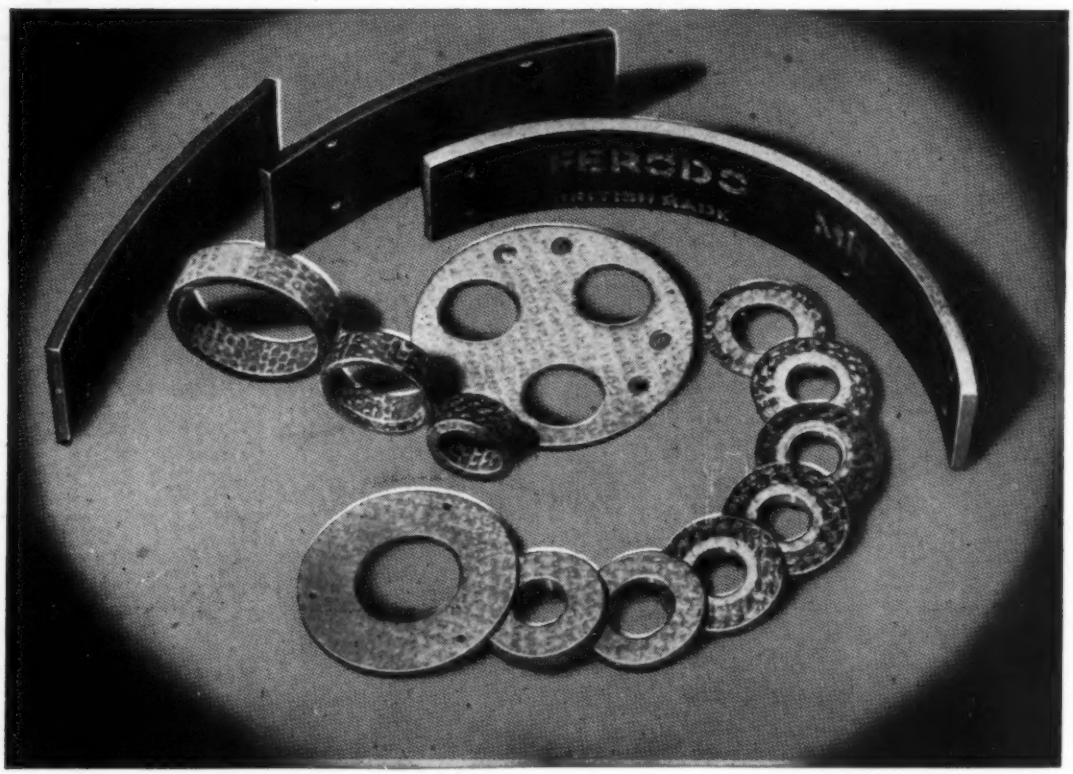
RECEIVED
MAY 19 1943
CHIEF ENGR'S
OFFICE

DOWTY

LIVE LINE hydraulic pump

on active service

Small things that matter...



IN MODERN AIRCRAFT CONSTRUCTION

The products illustrated are a few of those manufactured by Ferodo Limited, used in a wide number of applications in the construction of aircraft. Ferodo clutch discs and brake linings, Ferobestos bushes and washers, made to the finest limits and of the highest quality, possess high-tensile strength, lightness and durability. If you are concerned with the application of products of this nature, having special characteristics, you are invited to consult us, when the long experience of our Technical Staff will gladly be placed at your service, without obligation.

FERODO

Products for Aircraft Construction

FERODO LIMITED · CHAPEL-EN-LE-FRITH

FERODO TRADE MARK FERODO

FLIGHT and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

Editor
C. M. POULSEN

Managing Editor
G. GEOFFREY SMITH, M.B.E.

Chief Photographer
JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY:	BIRMINGHAM, 2:	MANCHESTER, 3:	GLASGOW, C.2:
8-10, CORPORATION ST.	GUILDHALL BUILDINGS, NAVIGATION ST.	260, DEANSGATE.	26B, RENFIELD ST.
Telegrams: Autocar, Coventry.	*Telegrams:* Autopress, Birmingham.	*Telegrams:* Iliffe, Manchester.	*Telegrams:* Iliffe, Glasgow.
Telephone: Coventry 5210.	*Telephone:* Midland 2971 (5 lines).	*Telephone:* Blackfriars 4412.	*Telephone:* Central 4857.

Registered at the G.P.O. as a Newspaper.

No. 1792. Vol. XLIII. April 29th, 1943. Thursdays, One Shilling

The Outlook

The Cap Bon Slaughter

JUNKERS 52 transports are, as Sir Arthur Coningham said, "somewhat coarse game," and if we were living in the days of Froissart it would hardly be thought creditable for a Spitfire or Warhawk to destroy them. But the 100 or so transport aircraft met off Cap Bon on Sunday, April 18th, had a fighter cover of 50 Messerschmitts, which succeeded in killing a few Allied pilots, and so the affair was not mere butchery of helpless rabbits.

It had been expected that Rommel would try to evacuate certain key men from Tunisia, and perhaps sick and wounded as well, but one wonders why he ran such risks as he did. Although Allied fighters have been intruding by night over Sicilian airfields, there would still seem a better chance of getting most of his transport machines safely home if he sent them by night.

When all is said and done, the Junkers 52 machines are very valuable to the Axis, if only for importing petrol and such-like munitions of war. Allied fighters can no more build a wall across the Sicilian narrows than across the English Channel, and some machines will always get through, just as some ships will always be able to steal across at night. But retail supplies will not help Rommel much; he needs wholesale stores, and by now the fleet of air transports is but a shadow of its former self.

Of one thing we may feel certain: the Germans are not attempting, and will not attempt, an evacuation by air on the scale of British evacuations by sea from Dunkerque, Greece and Crete. Even if all equipment is left behind, the men of a large army can only be moved by sea. The Axis does not command the sea, even between Sicily and Tunisia. General Eisenhower has stated that over 1,000,000 tons of Axis shipping have been sunk in the Mediterranean by British submarines (presumably since the Allied landing in North Africa), and the possibility of getting the majority of Rommel's forces away by ship may be dismissed—unless, of course, the Italian Navy comes out and scores a major victory over Admiral Cunningham's fleet Only two ports of any size, Bizerta and Tunis, are now left in Axis hands, and our bombers are rapidly reducing their utility.

Un-Pacific Imperialism

"FREEDOM of the Air" continues to exercise the minds of many both in this country and in the United States of America. As an ideal it is admirable, but in practice one may doubt its feasibility. Mr. Henry A. Wallace, Vice-President of the United States of America, as reported some time ago, advocated such a policy. Mrs. Clare Boothe Luce, in her maiden speech (the Americans would call it her freshman address) to the House of Representatives, challenged the Vice-President, and referred to his policy as "Globaloney." She argued that freedom of the seas did not prevent the present war and, therefore, freedom of the air would not prevent another war.

Other speeches on the subject, "Freedom of the Air," have been made in America, notably by Mr. A. A. Berle, Assistant Secretary of State, and Mr. Clarence F. Lea, who is chairman of the Interstate and Foreign Commerce Committee of the House of Representatives. The different views stated have provoked Mr. Wayne W. Parrish, publisher and editor of our contemporary, *American Aviation*, to an amazingly frank and outspoken comment in his issue of March 1st.

After referring to Col. Frank Knox's recent statement to the Foreign Affairs Committee of the House of Pepresentatives (that America was not avid for more territory,

but that it would be wise to insist on complete control and possession of a sufficient number of bases in the Pacific), Mr. Parrish points out that afterwards Col. Knox "quickly backtracked" and referred to the idea as wishful thinking. "Why," Mr. Parrish asks, "this assumption that this country does not want more territory? Why the humble tones of apology when the need for 'a sufficient number of bases in the Pacific' is discussed? Why not face the issue frankly? The United States should not only *want* more territory, but should make no apologies for going out and insisting on securing that additional land."

So far, we follow our esteemed contemporary. Why not, indeed? But our eyes open wide as we read on:—

> "The United States should become imperialistic in the Pacific—openly and aggressively. Not only should we take over every Japanese-mandated island, but we should assume complete control over every other island now nominally 'owned' by another nation as far south as New Zealand and the East Indies."

At this point we rub our eyes and read the paragraph again. Yes, indubitably that is what it says: "As far south as New Zealand and the East Indies." Those words finish the page, but, as instructed by a continuation line, we turn to page 10, which opens with the firm assertion that "There should be no exceptions, for he who insists on compromise in the Pacific has no understanding of air power or the ramifications of world air commerce."

The last six words seem to provide the clue. Mr. Parrish continues:—

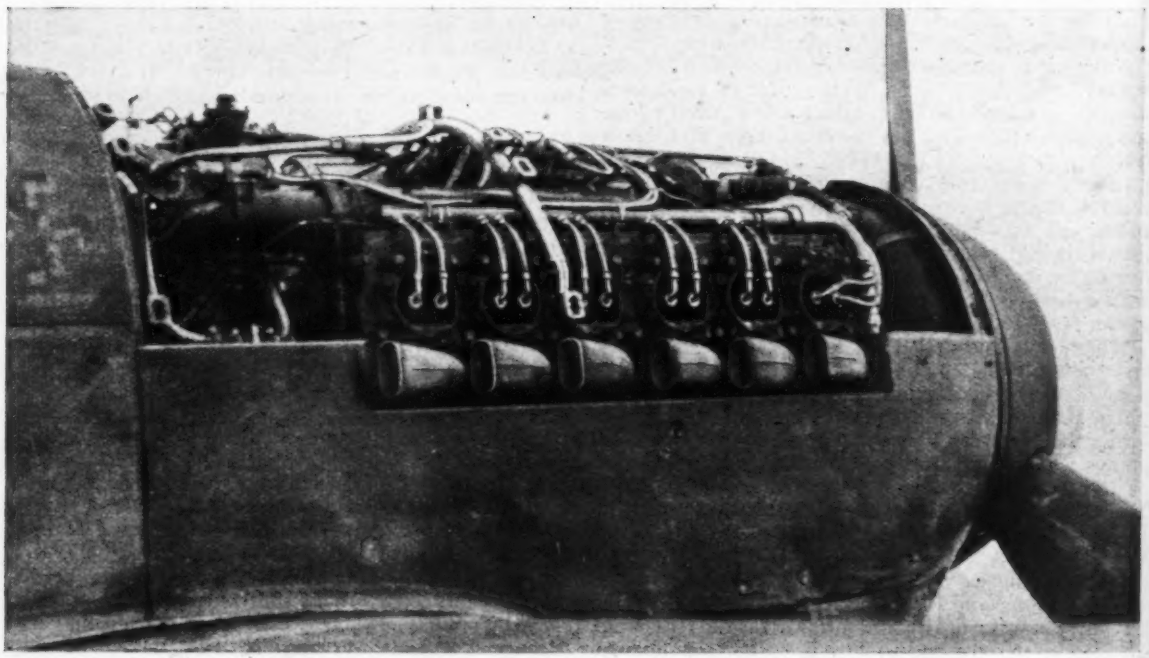
> "This country is undergoing the pains and turbulence of a world war. It has become the arsenal of a large part of the world. It has wrecked its normal peacetime economy to achieve certain goals and to make certain principles safe for ourselves and our Allies. Are we going to pay the cost of reaching these goals and turn the benefits over to others who probably could not have succeeded without our help?"

We are grateful to Mr. Parrish for that one little word "probably"! It does seem to admit that America's Allies have for three and a half years (and are still at it) done something, too, in the way of "wrecking our peacetime economy to achieve certain goals and to make certain principles safe for ourselves and our Allies." Great Britain, for example, did not need a Pearl Harbour to make her realise that she wanted to "make certain principles safe." It would be well if some U.S.A. critics such as Mr. Parrish could visit this country and see for themselves what British people have sacrificed in the fight for democracy and freedom. It would appear that British propaganda in America must be pretty poor.

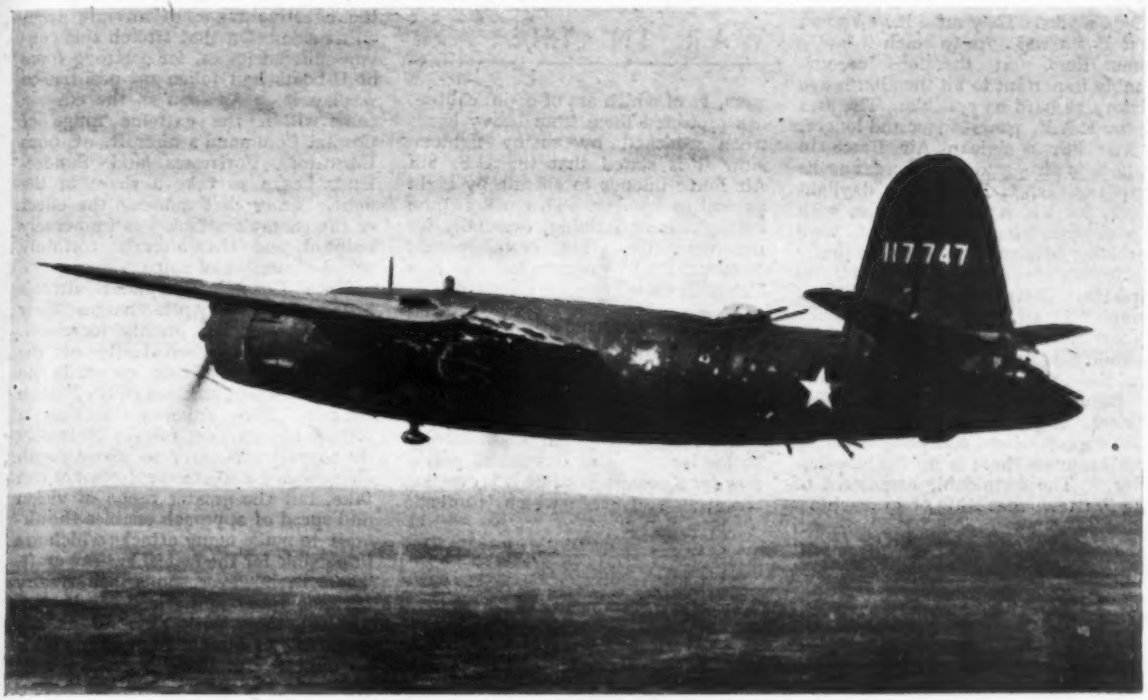
CONTENTS

The Outlook	433
War in the Air	435
Here and There	438
The Typhoon	440
The Harassing Hurricane	442
Aircraft Characteristics	444, a & b
Behind the Lines	445
H.M.S. *Indomitable*	446
Aileron Control	448
International Air Transport	449
In Parliament	450
Winter Airfields in Canada	452
Correspondence	454
Service Aviation	456

WORLD'S MOST POWERFUL ENGINE—THE NAPIER SABRE



The Hawker Typhoon (described on pages 440-441) has a Napier Sabre sleeve-valve 24-cylinder engine—four banks of six cylinders in H formation, but with the cylinders horizontal. This first photograph shows the unit with the upper half of the cowling removed. Observe the midway position of the exhaust stubs, each of which collects from a top and a bottom cylinder, and also the accessibility of the sparking plugs.



A Martin Marauder (B.26) struggling home to N. Africa after being badly shot up over the target. From this picture it will be seen that the Marauder carries eight .5in. machine guns for rear protection.

WAR in the AIR

The Cap Bon Battle : Tedder Hits Out in All Directions : Coastal Command and Convoys : Eighth Army Advances

IT will be long before the great air battle off Cap Bon is forgotten. It is another feather in the cap of that fine organisation, the Western Desert Air Force, now forming part of the Tactical Air Force of North Africa. Air Vice-Marshal Broadhurst's squadrons hail from Britain, from the Empire, and from the United States. The last-named are known as the United States Army 9th Air Force, and their Warhawk fighters are improvements on the earlier Kittyhawks. The Americans and the British have been working together so long that they quite understand each other's ways, and it is nothing new for the Warhawks to go out on patrol with a top cover of British Spitfires.

They were patrolling in that way on Sunday, April 18th, off Cap Bon, the tip of Tunisia which reaches out towards Sicily, when they spotted some 100 transport aircraft flying below, and almost skimming the waves. There was an escort above of Me 109s and 110s. The Spitfires immediately tackled the escort, while the Warhawks shot down the transporters pretty well as fast as one could shell peas. The fight took place near the land, and some of the Ju machines crash-landed on the shore near Cap Bon. It was a mighty slaughter. No less than 58 Ju transports were definitely shot down, while of the escort 14 Me 109s and two 110s shared the same fate. In addition, 30 other enemy machines were damaged. The Western Desert Air Force lost only a few pilots. Next day more Ju 52s were also shot down. The total Axis loss for the two days was 112 machines, of which 70 were Ju 52s.

The Cap Bon battle was only one incident of an exceptionally busy week-end. On the same day Malta's fighter-bombers attacked Ragusa, in the south of Sicily; strong formations of Fortresses of the Strategic Air Force raided once again the airfield and marshalling yards of Palermo; Mitchell bombers attacked the harbour of Porto Torres, in northern Sardinia, and an airfield in the island, and that night (Sunday) Bomber Command again sent four-engined bombers on the 1,500-mile return trip to do more damage to the Italian naval base at Spezia. There were also a number of minor operations, and activities continue. Nothing that air power can do to assert Allied supremacy in the Mediterranean area is being left undone.

The Axis riposte on that busy Sunday was almost ridiculous. Some enemy bombers flew to Algiers by night, but very few penetrated the defences and five were shot down. Naturally the few who got through did succeed in knocking down some civilian houses and taking a few lives.

Spezia has not been the only target of late for a long-distance raid by Bomber Command. Reports received by the British Intelligence organisation show that the attack on the Skoda works at Pilsen on April 16th devastated completely about 50 acres, including some of the most important shops. Even before Essen had endured the series of recent very heavy raids by Bomber Command the Germans had begun to do what they could to increase the importance of the

Skoda works. They must have known that Essen was sure to catch it badly some time. It therefore became doubly important to hit the alternative factory as hard as possible. The arm of the R.A.F. grows longer and longer.

The 8th American Air Force in Britain is also gradually increasing its activities, specialising on daylight work, for which the Fortresses, with the super-excellent bomb sight, were specially designed. They recently made an important day raid on Bremen. Their design, however, contemplated action over the Pacific Ocean and the Caribbean Sea, where visibility is usually extremely good, and the cloudy skies and misty ground of Europe often handicap the bomb-aimers. None the less, the crews are gaining experience, and of their daring and keenness there is no doubt whatever. The formidable armament of the Fortress, consisting of 13 machine-guns, 12 of which are of 0.5in. calibre, has protected them from heavy losses when attacked by enemy fighters. Now it is stated that the U.S. 8th Air Force intends to operate by night as well as by day. This will require quite different training, especially for the navigators, but certainly the Americans will prepare for the new rôle with their customary enthusiasm.

WAR IN THE AIR

Coastal Command at Work

THE Admiralty has announced that recently (no dates were given) an Atlantic convoy had a four days' fight with U-boats in which machines of Coastal Command highly distinguished themselves. The dangerous period now for a convoy is while it is crossing the stretch of ocean which is outside the effective range of aircraft from either side. On that stretch this convoy suffered losses, for a strong force of U-boats had taken up position to waylay it. As soon as the convoy came within the extreme range of Coastal Command's aircraft, at once Liberators, Fortresses and Sunderlands began to take a share in the fight. From that moment the effect of the enemy's attack was immensely reduced, and the aircraft certainly saved a number of ships.

Since Coastal Command aircraft began to carry depth charges their hitting power has greatly increased. Reporting the whereabouts of the enemy to the surface escort is no longer the main function of the British aircraft. They are now definitely a formidable striking force. Naturally no aircraft can carry so many depth charges as a corvette or destroyer can take, but the greater range of vision and speed of approach enables the aircraft to make many attacks which are impossible for the fastest surface craft. There is, however, no selfish rivalry between Navy and Air Force in this matter; they work together as one team in the utmost harmony, and if an aircraft can bring a destroyer up in time to attack a U-boat, the chances of that submarine escaping without damage are very much reduced. Reports by the aircraft of U-boats lying ahead in wait sometimes enable the convoy to change course in time and so escape attack.

Fighter Command

FIGHTER COMMAND has lately been maintaining a non-stop offensive over adjacent parts of the Continent, attacking almost as vigorously by night as they have been doing by day. As a result, the trains which the Germans run by night enjoy no immunity from attack, and the casualties to engines and rolling stock mount up. It is important to note that the Germans do not allow French and other subjugated peoples to travel by train at night, and so our pilots can attack the trains in the dark with no fear of hurting our friends.

For a long time past Mustangs of Army Co-operation Command have been sharing in these fighter sweeps, playing the part of ground-strafers. Recently it was announced that bombers of the same Command took part in a raid on the Continent. It has been known that that Command includes bomber squadrons, but this was the first mention of them in action for some weeks. It would probably be not far wrong to say that Army Co-operation Command is modelled on the Western Desert Air Force. The latter has worked out in actual warfare the best way in which an Air Force can help an Army, and it includes reconnaissance machines, light and medium bombers, fighter-bombers, tank-busters, and the indispensable force of covering fighters, in addition to such ancillary units as

SHORT ENGAGEMENT: Two pictures of an unfortunate Focke-Wulf 200 which met some long-range Beaufighters over the Bay of Biscay. It was destroyed after a combat lasting only three minutes.

WAR IN THE AIR

ENEMY AIR LOSSES TO APRIL 17th

	Over G.B.	Continent	Middle East	N. Africa
April 11	0	1	0	41
" 12	0	0	0	12
" 13	0	2	1	11
" 14	4	8	0	21
" 15	0	2	2	2
" 16	4	5	2	7
" 17	0	5	2	42
	8	23	7	136

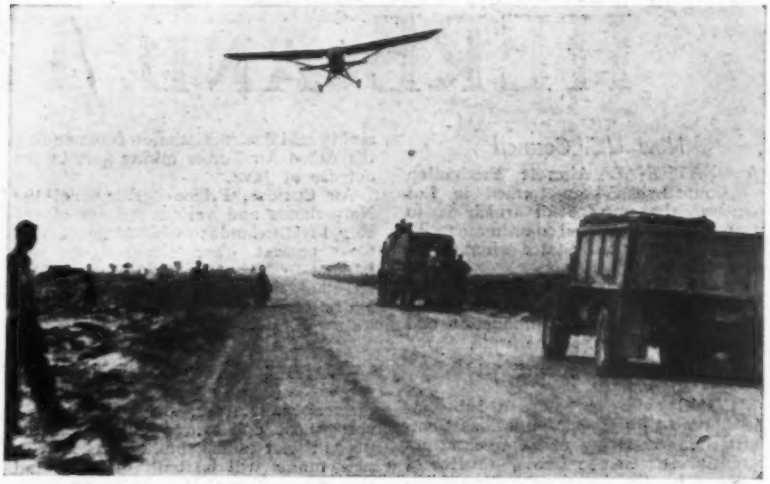
Totals : West, 6,810 ; Middle East, over 5,281 ; North Africa, 1,328

transport aircraft (would that there were more of them!) and ambulance machines. The last-named may not be so essential in European warfare as they are in the desert, but there may always be times when rapid transport by air will save lives which would otherwise be lost.

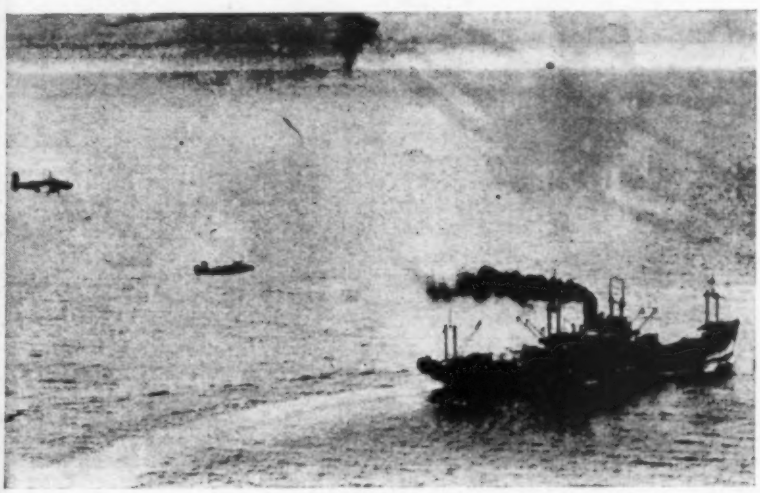
It is, however, well known that when the United Nations invade the Continent, the air support of their armies will not be limited to the squadrons of Army Co-operation Command. The whole of Bomber Command will lend a hand in the way most suitable to each class of squadron. In the meantime it is a good thing to give the bomber squadrons of A.C. Command some practical work on the Continent.

Mosquitoes now have an intimate connection with special Nazi days, and take a delight in upsetting whatever jubilant feelings they may inspire in the people of Berlin. Not long ago they made two daylight raids which interfered with broadcasts by Göring and Göbbels. Hitler's birthday provided another such opportunity, and accordingly on that night a force of Mosquitoes paid another visit to the Capital of the Reich. It was a busy night for Bomber Command, and the Baltic ports of Stettin and Rostock were also raided, and in both cities great fires were started which were seen burning ten hours later when a reconnaissance machine of the R.A.F. flew over them. The Russians also joined in that night with a bombing raid on Tilsit, a city famous for the treaty signed there in 1807 between Napoleon and the Tsar. This treaty, says the *Encyclopædia Britannica*, "registers the nadir of Prussia's humiliation." Another humiliation for Prussia is impending, in which Russia will certainly play a major part, while France will surely contribute her share, so Tilsit is a place of good omen.

In the Far East, the Americans are now paying serious attention to the Japanese in the Aleutian island of Kiska, and the bombing raids on the place have been growing in frequency and weight. The final day of reckoning with Japan has not yet arrived, but it will certainly come. The news that the Japanese put to death some of the American airmen who were taken prisoner in the raid on Nippon from the carrier *Hornet* a year ago has filled the civilised world with horror. Not long ago we fondly imagined that the Japanese had emerged from mediæval barbarism and had become civilised. But, then, we also thought the same of the Germans.



IMPROMPTU AIRFIELD : A Vultee Vigilant taking off from the El Hamma road after landing a liaison officer.



MAST-HIGH ATTACK : Two North American Mitchells bombing a Japanese transport on the Bismarck Sea.

The Enfidaville Battle

IN the opening stages of the Eighth Army's attack on Rommel's position at Enfidaville, aircraft could play no direct part. General Montgomery attacked by night, and the arms which he used were the infantry and the artillery. He is an adept at ringing the changes in his methods, and he always uses the arms most suitable for the job in hand at the moment. When day broke the air arm was not used against the enemy's positions in the hills, for bombs do not produce their best effects in mountain warfare. Near misses cannot be reckoned on to do damage—in fact, if the slope is steep, a miss may literally be as good as a mile. Our aircraft were launched in full strength against the enemy's airfields with the object of preventing the Axis air arm from interfering with the back areas of the Eighth Army on the plain below. That was the best service they could render.

BRITISH & U.S. AIR LOSSES to APRIL 17th

	Over G.B. A'crft.	Continent B'brs.	Continent F'trs.	Middle East A'crft.	N. Africa A'crft.
April 11	0	4	2	0	14
12	0	0	1	0	2
13	0	4	3	0	3
14	0	23	4	0	8
15	0	0	3	0	0
16	0	55	5	0	3
17	0	16	6	0	12
	0	102	24	0	42

Totals : West, 5,740 ; Middle East, about 2,086 ; North Africa, 510.

HERE AND THERE

New U.S. Council

A NATIONAL Aircraft Production Council has been formed in Los Angeles, the purpose of which is to increase production and co-ordinate facilities of the United States aircraft industry.

The sixteen aircraft and engine manufacturers represented in the Council will pool their resources for production and repairs at home and at the front.

Mustang is No. 1

GIVING evidence before a sub-committee of the Appropriations Committee of the House of Representatives recently, Dr. George Lewis, director of research for the American National Advisory Committee for Aeronautics, stated that the North American P-51 is now the best U.S. fighter. Referring to the thin wing of the Mustang, which was developed by the N.A.C.A., Dr. Lewis said "it has many possibilities, especially for high-speed aircraft.

"Development indicates that in many cases it is possible to design a wing form or shape that will reduce the drag by as much as 50 per cent. of the drag of the normal wing."

Honour for Dutch Commander

THE Dutch Air Commander, Maj. Gen. L. H. Van Oyen, has been appointed an Honorary Companion of the Most Honourable Order of the Bath for his ability and determination in commanding the Allied Air Forces taking part in the defence of Java.

Air Comdre. Prince Bernhard of the Netherlands and various officers of the Royal Netherlands forces and the R.A.F. were present when the insignia was handed to Maj. Gen. Van Oyen by Sir Archibald Sinclair on behalf of His Majesty the King.

Bumps

ANOTHER item of new construction is a gust tunnel at Langley Memorial laboratory, Virginia. This will cost 60,000 dollars, and will replace the present gust tunnel, built in 1936. The new tunnel will be built of wood and will have a larger air jet than the existing tunnel so as to enable larger and heavier models to be tested in stronger gusts. The tunnel speed will be 80 m.p.h

New Equipment

EQUIPMENT recently completed at Langley Field includes: a 16ft., 500 m.p.h. wind tunnel; a new seaplane testing channel; a seaplane impact basin; a new low-turbulence, variable-density wind tunnel; and a new stability wind tunnel. When completed, Moffett Field will have a 16ft. high-speed tunnel, two 7ft. by 10ft. low-turbulence tunnels, a full-scale tunnel measuring 40ft. by 80ft., a 12ft. high-speed variable-density tunnel, and a supersonic wind tunnel.

In addition to all this, there is the engine research laboratory at Cleveland, Ohio, to which the power plant engineering group has been transferred from Langley Field. At Cleveland it will be possible to test engines of far greater power than any so far contemplated, at speeds above present fighter speeds and in density and temperature conditions corresponding to sub-stratosphere flight.

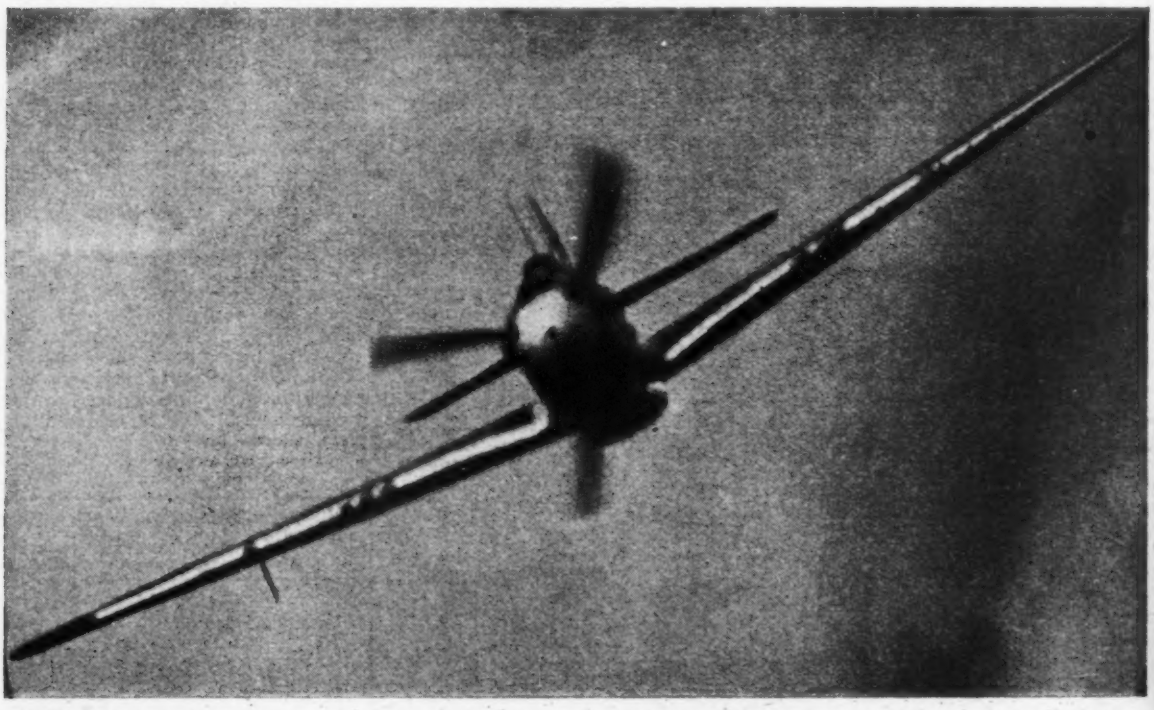
University Research

TO assist in the research work, the N.A.C.A. has "sub-contracted" to 30 university laboratories more than 80 research problems. In its report to Congress the N.A.C.A. states that this farming-out to the universities has resulted in "many valuable contributions to aeronautics." The subjects covered aerodynamics, power plants, aircraft materials and aircraft structures.

Contracts to schools achieved improved methods in spot-welding aluminium alloys, a time-saving substitute for riveting, improved materials for turbo-superchargers, improvement of heat exchangers, studies of flutter, and development of super-fuels.

New Programme

DURING the next 18 months the N.A.C.A. expects to investigate the following problems: Stability and control; cowling and cooling; increased airscrew performance; factors affecting aircraft speed; aircraft wing develop-



AMERICA'S AXIS ENEMY No. 1: As related in a paragraph above, the North American Mustang (P-51 in the U.S. Army Air Force) has been officially acknowledged to be the best U.S. fighter. This picture gives a fine impression of an Allison-engined Mustang, with its mixed armament of 0.5in. and 0.303in. machine guns, as used by Army Co-operation Command. The fitting of the Packard-built Merlin XXVIII engine should improve its already good performance still further.

HERE AND THERE

ments; external loads; aircraft structural problems; characteristics of rotating-wing aircraft; spinning; methods of preventing ice formation; jet propulsion; flutter and vibration; heat flow and boundary layer; theory of air flow; planing surfaces, hydrofoils and high-speed surface craft.

Within a few months the National Advisory Committee for Aeronautics will have all its establishments working on a three-shift basis "around the clock."

Lucky N.A.C.A.

SIR ROY FEDDEN, on his return from America, warmly applauded the action of the United States in spending vast sums on aeronautical research. The House of Representatives recently approved, without a dissentient vote, the sum of just under 19½ million dollars for the National Advisory Committee for Aeronautics for the financial year 1944. A little over half of that sum will be absorbed by salaries and expenses.

Most of the rest will defray operational costs, since much of the new equipment has already been installed. An exception is the completion of the equipment at the Ames Aeronautical Laboratory at Moffett Field, California, for which three and three-quarter million dollars has been voted.

Handley Page Lecture

LANCASHIRE readers will be interested to learn that Sir Frederick Handley Page is to give a lecture in Manchester next month on "Commercial Air Transport."

The occasion will be the fourth annual lecture of the Manchester Association of Engineers, and will be held in the Great Hall of the College of Technology, Sackville Street, Manchester, on Friday, May 28th, at 7 p.m.

Admission to the lecture will be by tickets obtainable from the Assistant Secretary of the Association, St. John Street Chambers, Deansgate, Manchester, 3.

HIGH TEA? Bostons took such a prominent part in the scattering of Rommel's African columns that their forays became known as "Boston Tea Parties." From the apparent altitude of this one, the occasion was evidently "high tea!"

International Crew

THE international character of some bomber crews of the R.A.F. is well known, and typifies the united character of the fight against Axis aggression.

A recent example to come to light was that of a Halifax operating with Coastal Command, in which the crew included a Dutch first pilot, a Briton born in the Tonga Islands as second pilot, an Australian, a Canadian, two Londoners, and a sergeant flight-engineer from Nottingham.

The second pilot, incidentally, came from Fiji to join the R.A.F. and received his training in Rhodesia.

Badge for Canadian Aircraft Workers

A BADGE showing a silver aircraft over a red maple leaf on a white background is now being given to aircraft factory workers in Canada, "to show that they are war workers on the factory front."

It is described as being intended "for street wear" and has a blue rim bearing the words "Aircraft Production." To qualify for such a badge—or broach in the case of women workers—it is only necessary to have been so engaged regularly for three months.

Canada's aircraft industry now employs more than 80,000 men and women, as against approximately 1,000 men before the war, so if they all get one the amount of material absorbed (presumably metal) will be fairly considerable!

Growth of Airgraph Service

BEGUN two years ago "on a few forms in a corner," the airgraph section at the London G.P.O. is now well on the way to becoming one of the busiest branches in the huge sorting office.

One day recently the section handled 390,000 airgraphs from troops overseas and 250,000 outgoing messages, and among various labour-saving devices recently installed is a machine for folding the incoming airgraphs at the rate of 30,000 an hour.

Efforts are being made, it is stated, to recruit more women sorters.

"Flight" Photographs

FLIGHT postcard-sized photographs of aircraft are obtainable from this office at 6d. each and 5s. per dozen.

This series covers a wide range of aircraft and includes machines of the R.N.A.S., R.F.C., R.A.F., Fleet Air Arm, America and Germany.

A list of types available, together with a specimen photograph, will be sent on receipt of a remittance of 6d.

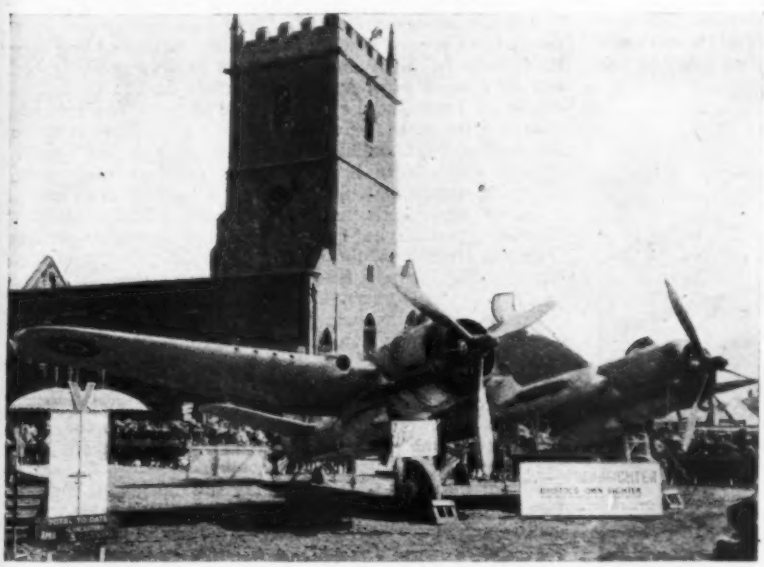
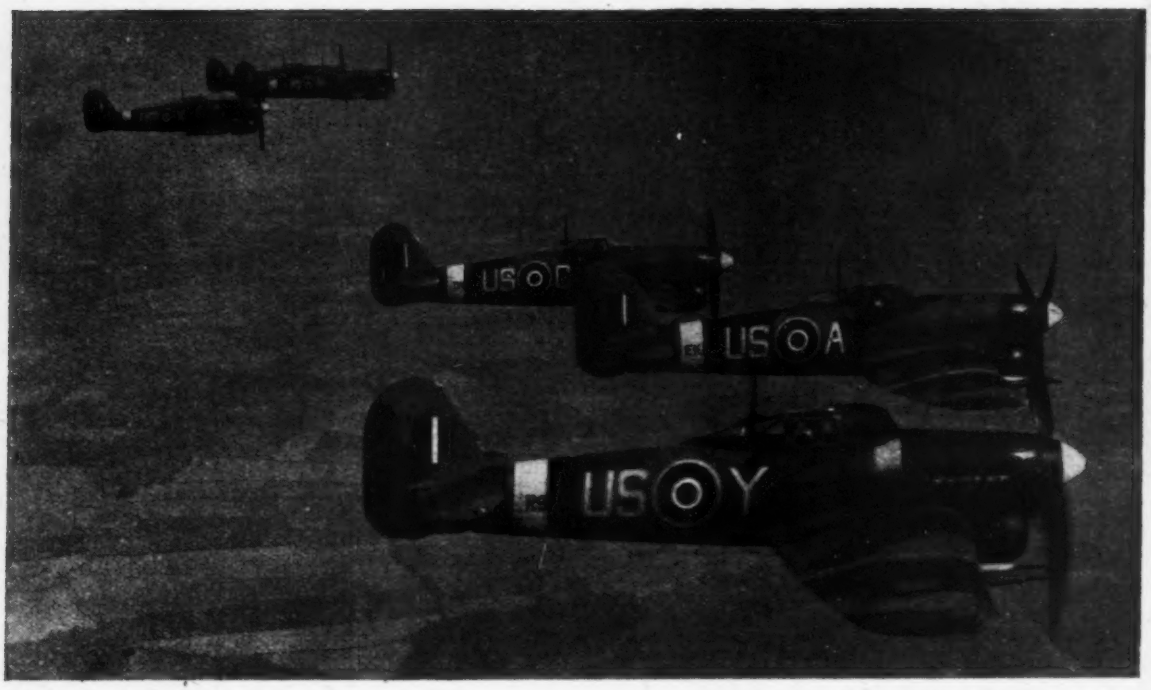


EXHIBIT "A": A Beaufighter I was Bristol's contribution to the city's "Wings for Victory Week." Powered by a pair of Hercules sleeve-valve engines and armed with four cannon and six machine guns, it is the most powerfully armed fighter in the world.



High-speed station keeping. The Typhoon is very manoeuvrable in spite of its size and weight, and close formation can be kept.

The Typhoon

First Pictures of Our Latest, Fastest and Most Powerful Single-engined Fighter

Illustrated by "Flight" Photographs

DURING its operational career, which is not a very long one, the Hawker Typhoon has proved itself a formidable aircraft, whether against enemy raiders or surface targets. Although larger and heavier than the Fw 190, the Typhoon is very manœuvrable as well as fast, a fact which has played an important part in its successes, which already include the bringing down of some 40 tip-and-run raiders. One squadron alone has accounted for 20 raiders this year. In one sortie one pilot shot down three raiders, and during a period of nine days two squadrons destroyed eleven enemy aircraft between them.

The business end of a Typhoon Ib. The flap which controls the air from the radiator is in the open position as for climbing. On top of the cockpit cowling may be seen the transparent blister which contains the "look-behind" mirror.

Against surface targets the Typhoons of Fighter Command have proved equally successful. Attacks have been made both by night and by day on railway goods trains, lorries, barges, tugs, and other targets on the roads and canals of France and Belgium. One squadron recently damaged its 100th locomotive in just over three months. At sea the Typhoon has also found many useful targets, among which have been E-boats, trawlers and minesweepers, many of which have been heavily attacked.

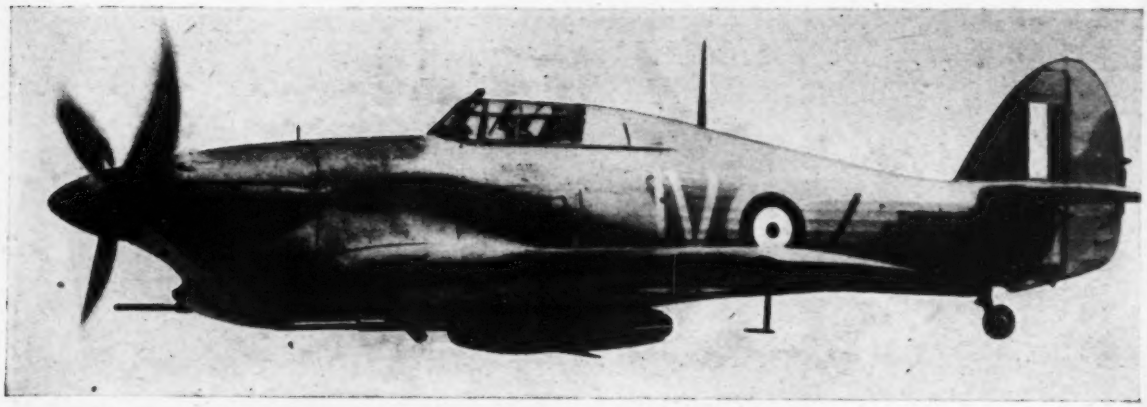
In its general design the Typhoon follows orthodox Hawker practice, but structurally it differs considerably from the Hurricane, the most notable difference being the stressed-skin form of fuselage in place of the girder-type fuselage of the Hurricane.

The Napier Sabre, which is in the 2,000 h.p. class, is a 24-cylinder sleeve-valve, liquid-cooled engine of H formation, the cylinders being horizontal. This arrangement enables exhaust stubs to emerge through the sides of the engine cowling, each stub serving an upper and a lower cylinder. The radiator is mounted below the engine, with a forward-facing permanent opening and a flap at the back for controlling the flow of the cooling air.

Actual performance figures may not be given, but the fact that the engine is of some 2,000 h.p. indicates that a speed in excess of 400 m.p.h. would not be an unreasonable assumption. The Typhoon is a larger machine than the Hurricane, the span being 41ft. 7in. and the length 31ft. 11in.

Of the two models of Typhoon the Ia has 12 0.303 machine-guns in the wings, while the Ib has four 20 mm. Hispano cannon. The latter is shown in our pictures.

Most of the basic features of the Typhoon can be seen in these three views. The wings are fairly thick, so that even the four cannon can be housed within them. The transparent fairing of the cockpit cover affords the pilot a good view to the rear. These pictures show the Typhoon Ib. The Ia has twelve 0.303 Browning guns.



IN ITS LATEST FORM : Officially designated the Hurricane IID, this type with its two 40mm. cannons is more picturesquely known as the Tank Buster.

THE Hawker Hurricane has, without doubt, proved itself to be the most versatile weapon of this war. On these pages the Hurricane is shown in a number of its many types—from the prototype which flew in 1935 to the new 40 mm. cannon-armed tank attack IID model, which has played such a large part in the series of victories of the 8th Army.

Our story deals almost exclusively with the deeds of the Hurricanes in the Middle East Command wherein, over a long period, they have been fighters, bombers, Army co-operation and close Army support aircraft rolled into one.

At the same time, it must not be forgotten that the Hurricanes bore the brunt of the Battle of Britain nor that they were our standard " cat's-eye " night fighters for a while.

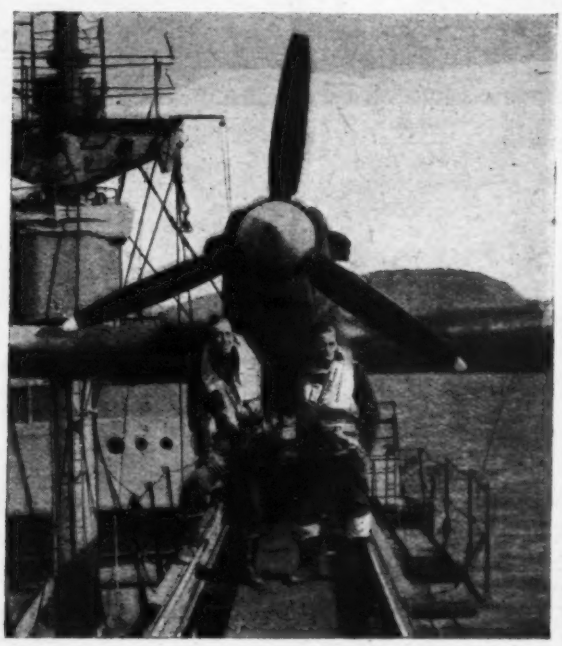
Hundreds of Hurricanes have also been delivered to the Russian Air Force, and the Russian pilots are very impressed by their fire power and flying qualities.

The Harassing Hurricane

Its Exploits in the African Theatre: Greece, Crete, Abyssinia, Somaliland, Eritrea

TAKE the skill, courage and devotion of the fighter pilots during the Battle of Britain. Take the determination to oppose the enemy, no matter what the odds and where the place. Take the perfect co-ordination of man and machine—and you have some assessment of the

The Hurricane IIC as employed in the Middle East. It has tropical radiator and air intake, two 20mm. Hispano cannons in each wing, long range tanks which are interchangeable with bombs and ejector exhaust stubs.



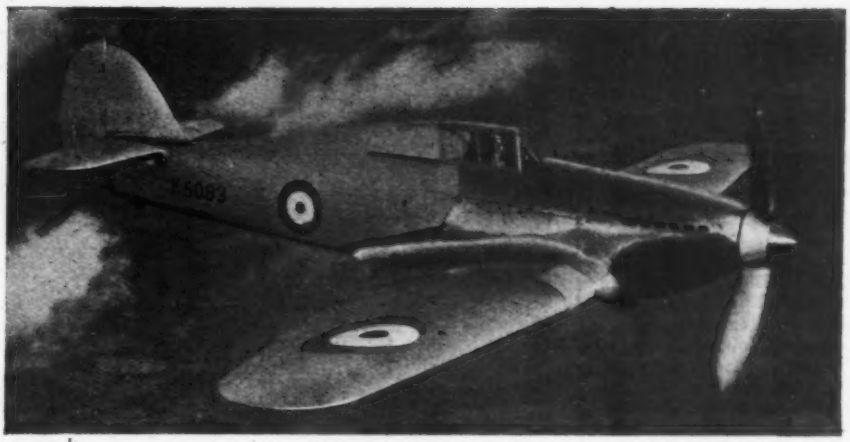
To protect our merchant convoys out of the range of our land based aircraft, a number of ships have been fitted with catapults to shoot off Mark I Hurricanes. When the fuel is exhausted the pilot either bales out or alights on the sea and is picked up.

THE HARASSING HURRICANE

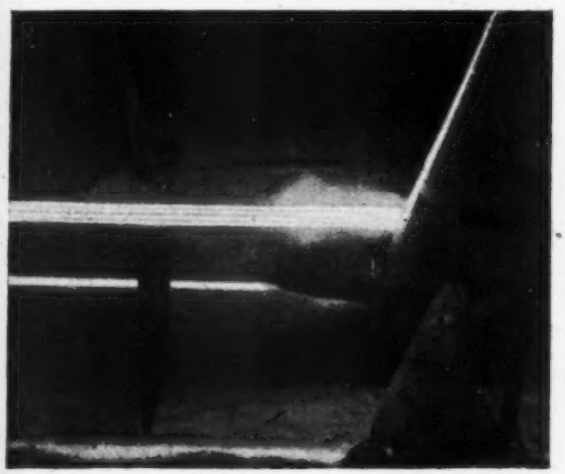
part played by the Hurricane of Middle East Command in the driving of Rommel and his *Afrika Korps* behind the defences of Tunisia.

The Hurricane was the first modern fighter to appear in the Western Desert, and it was the first object of fear to the *Luftwaffe* and the *Regia Aeronautica*, every type of whose fighter and bomber in turn came under the Hurricane lash. There were many unequal battles in the early days, but by sheer offensiveness the R.A.F. Hurricanes won the aerial superiority that made the Eighth Army's advance possible. The greater the odds, the greater zest did our pilots show for the fight.

At one forward landing ground, five Hurricanes rose to engage a force of nearly 40 German and Italian bombers and fighters. Seven of the enemy aircraft were destroyed, with two probables. Several of the remainder were damaged before they headed for home.



Grp. Capt. P. W. S. Bulman, of the Hawker Aircraft Co., testing the prototype Hurricane in December, 1935. It had fabric wings, as did a number of the production models until the change over to all metal.



The eight .303in. Browning machine guns of a Mark I Hurricane being fired into the stop butts at night.

There was a Durban pilot who went into his first engagement with the enemy undeterred by the fact that they were seven Stukas. He shot down two of them.

A formation of 20 German dive-bombers, accompanied by five Messerschmitts, was intercepted by 10 Hurricanes of a famous Australian squadron. Five dive-bombers and three Messerschmitts were shot down and the rest routed. Two days later, the same squadron destroyed 14 dive-bombers that ventured over without fighter escort. In these two engagements, the Australians lost only one fighter.

Low-flying Attacks

Axis ground forces also felt the weight of the Hurricanes' blows. Concentration of German and Italian troops, encampments, landing grounds, tanks, armoured cars, motor transport, armed motor-cyclist dispatch riders; all were fair game in fearless low-flying attacks.

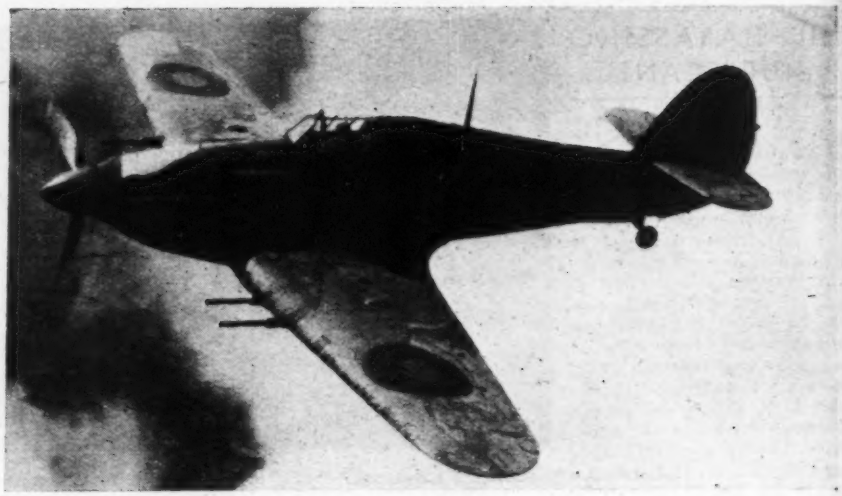
One of the highlights of the British 1941 campaign was the exploit of a long-range Hurricane squadron which, for months, operated from an isolated desert base well south of the enemy forces. Bronzed, bearded pilots of this squadron harried supply lines, retreating columns and landing grounds far behind the fighting area. The squadron destroyed more than 30 enemy aircraft on the ground, 13 in the air, and more than 400 vehicles.

Few outside the gallant garrison of Tobruk realise the part played in that eight-months' stand by the Hurricane fighters who provided cover for the seaborne supplies to the port. In an effort to cut off these supplies, the enemy threw in dive-bombers and fighters in constant attacks on merchant ships and their naval escorts. Time and time again, patrolling Hurricanes beat them off and saw the precious cargoes safely to the beleaguered men.

Over the sea outside

The Hurricane IIB, the first of the bomber versions, carried two 250lb. bombs and had twelve .303in. machine guns in the wings. The engine was a Rolls-Royce Merlin XX.

THE HARASSING HURRICANE



For low strafing and medium height fighting the Hurricane IIC with its four 20mm. cannon is a sturdy killer.

Tobruk, a South African squadron shot down six enemy aircraft for the loss of one, and on another occasion a R.A.F. squadron accounted for five without loss.

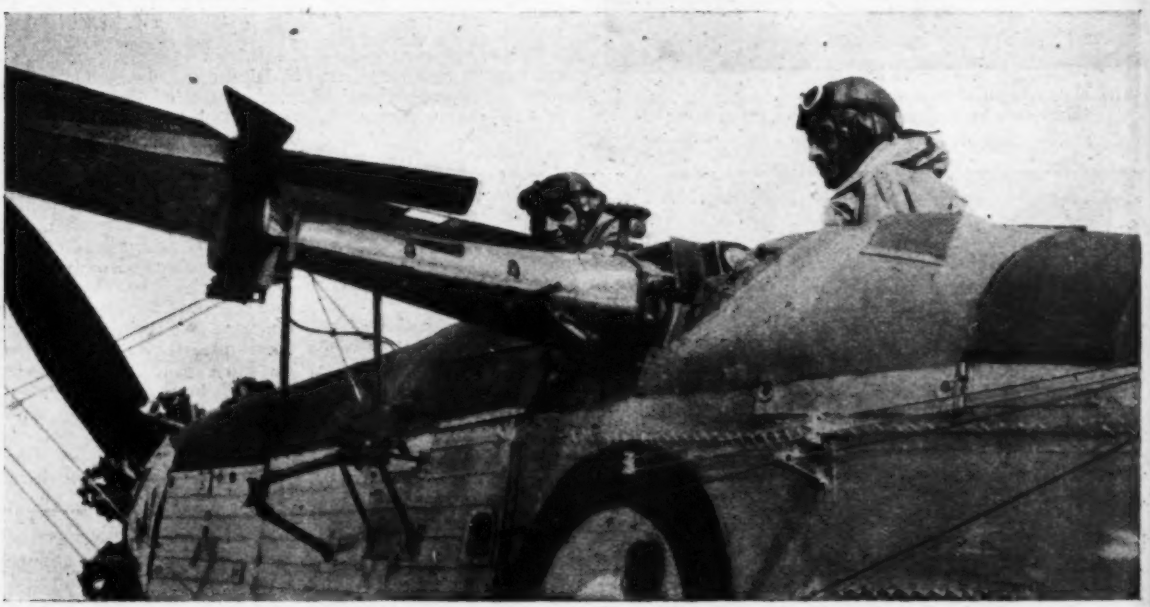
Aircraft that attacked the town itself fared no better. One April day, nine German bombers appeared high over Tobruk. Hurricanes took off and shot down four of them. Suddenly, twenty escorting Me's attacked from above, and the troops on the ground cheered wildly when four of them were sent hurtling.

The Hurricane was the first fighter-bomber in the Western Desert, where it was operating against the enemy as early as March, 1941. As soon as it appeared, tanks, armoured cars and motor transport felt the weight of its bombs, followed by the just as effective power of its guns. The Hurricane jumped in as the R.A.F.'s desert man-of-all-work. Armed reconnaissance, Army co-operation, night fighting and photographic reconnaissance were only a few of the jobs the pilots took on, almost within hours of seeing the desert for the first time.

Greece—Crete: Hurricanes were in to the end. They chased a numerically superior Italian air force from the skies; they operated for six months in some of the worst flying weather imaginable. They provided fighter cover for our forward troops until sheer weight of Nazi numbers forced them back to only two airfields in the Athens area. Pilots were given no rest, nor did they ask for any. Aircraft that were full of holes—in some cases with parts of wings blown off—went up again, without repairs, to cover the evacuation. Even when the airfields of Crete were denied them, long-range Hurricanes continued to engage the enemy from bases in North Africa. The long sea crossings were covered without any thought of the personal safety of the pilots.

It was the same story in every African theatre of war: Abyssinia, Somaliland, Eritrea. It was the same story in Malta. There was a time when a handful of Hurricanes was the island's only fighter defence. These aircraft, and the boys who flew them, went through an ordeal that tested man and machine to a point, theoretically, beyond human and mechanical endurance. No odds were ever too great to deter them from engaging the enemy who, day after day, threw himself with fury against the island. Daily they performed deeds of valour that will be talked about as long as courage and self-sacrifice count for anything in the hearts of men.

New types of aircraft may come to retain the mastery of the skies won by the Hurricanes of the Middle East, but the pilots will never cease to pay their tribute to the old "Hurri-bus."



STILL IN SERVICE: A Westland Wapiti of the Indian Air Force, now adapted for target towing. Incidentally, the Indian Air Force celebrated its tenth birthday on the day of the R.A.F.'s jubilee.

THE WALTON YACHT WORKS LIMITED

Forty-sixth of the Latest Recognition Series

Aircraft Types and Th

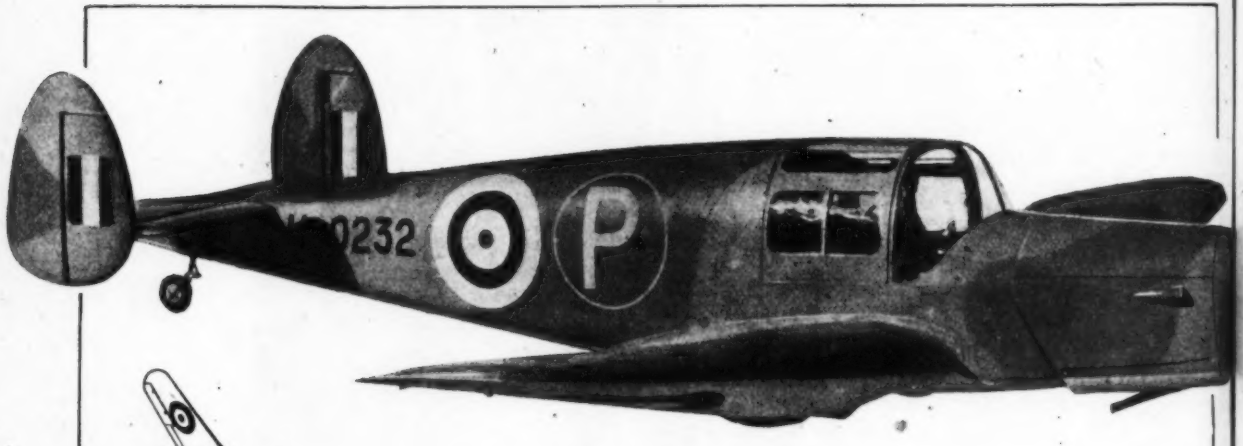
MILES M.28

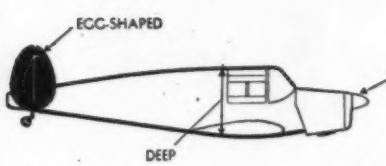
DESIGNED to fulfil two major functions, namely, that of two-seater *ab initio* and/or intermediate trainer, and as a three-seater communications aircraft, the Miles M.28 is, in fact, the first light aircraft of its type to be built in Great Britain since war began, and the attractive features of its car-type side-by-side seating, excellent visibility from the low-cut windows of its roomy cabin, and admirable speed-range from 40 to 176 m.p.h., coupled with the operating economy of a 150 h.p. air-cooled in-line engine suggest obvious possibilities as a post-war private-owner's choice.

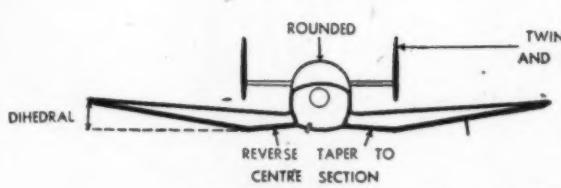
Actually a four-seater version intended for use as a communications type by the A.T.A. is also on the way, and here, in effect, is a potential light civil aircraft of considerable appeal.

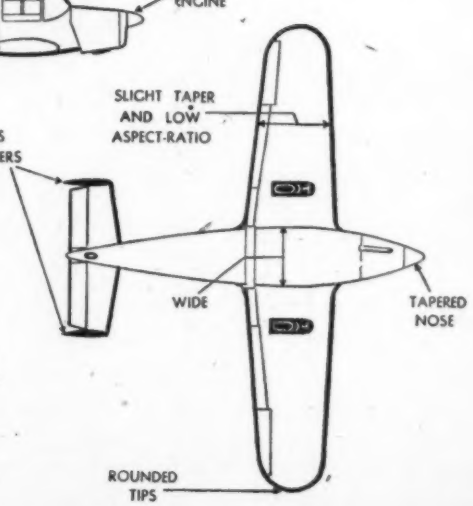
From the recognition angle, it should be quite an easy addition to the list, for the lines of its tapered nose and rather high, rounded cabin which is faired smoothly into the cleanly tapering fuselage, and its twin egg-shaped fins and rudders give it an attractively distinctive appearance from any angle. The wings are of comparatively low aspect-ratio, slightly tapered to symmetrically rounded tips, and the short undercarriage retracts backwards into the thickest part of the centre-section which is where it meets the outer panels. Miles low-drag auxiliary flaps combined with a fuselage air-brake and dropping ailerons are fitted, and the power unit is either a Cirrus Major 150 or Gipsy Major Series IIA, in which case a fixed-pitch airscrew is fitted, or a Gipsy Major Series III, or IIIS with constant-speed airscrew. With the last-named refinement the top speed is 176 m.p.h., but in the case of the fixed-pitch airscrew it is reduced to 155 m.p.h. Landing speed is 40 m.p.h. on all models.

In the case of the three-seater communications version, the third seat, behind the side-by-side seats, is in a raised position, the occupant's head being in what might be described as a streamlined astrodome to the rear of the normal cabin top.







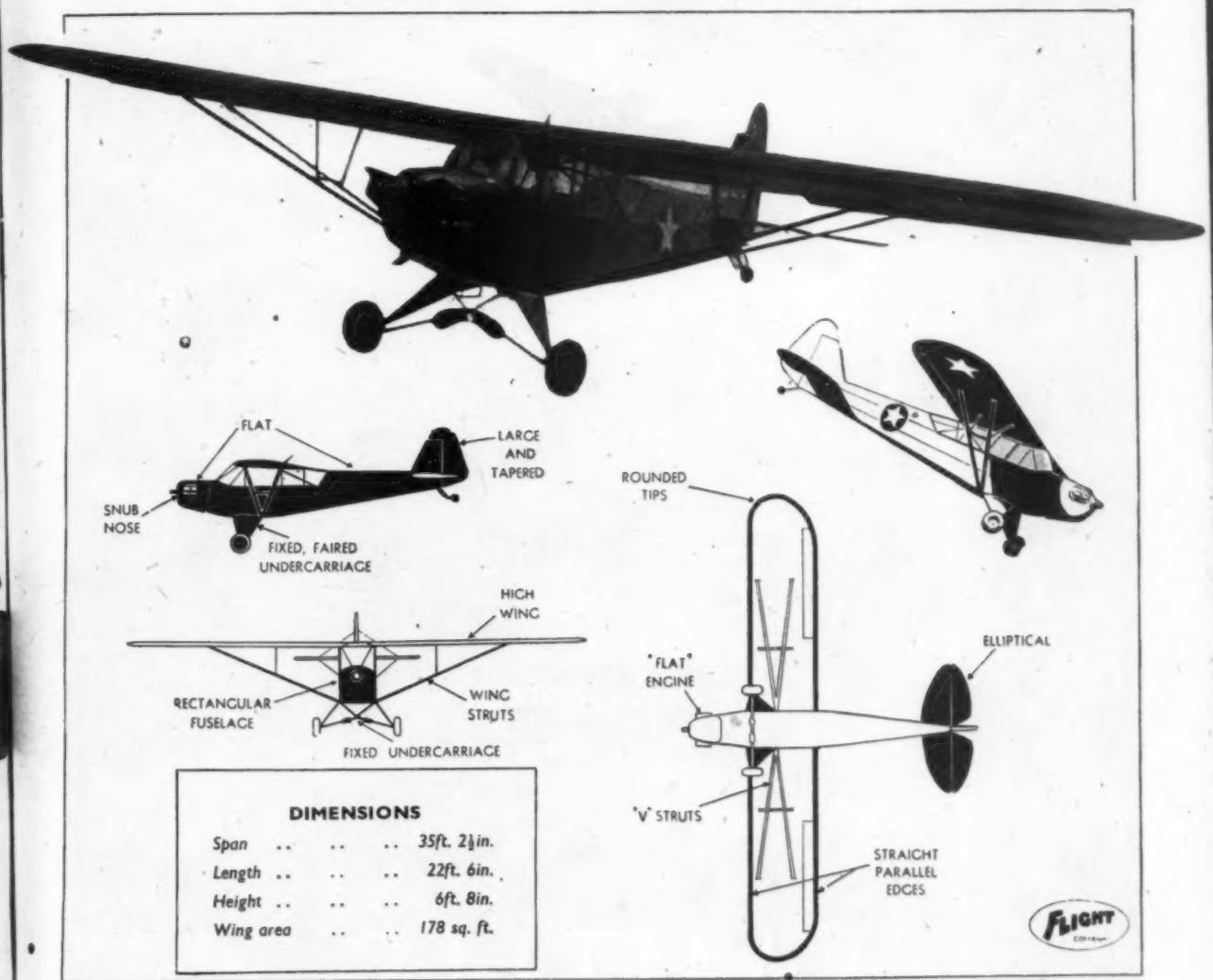


DIMENSIONS

Span	*30ft. 6in.*
Length	*22ft. 1½in.*
Height	*8ft. 6in.*
Wing area	*160 sq. ft.*

Their Characteristics

PIPER L-59A



DIMENSIONS

Span	*35ft. 2½in.*
Length	*22ft. 6in.*
Height	*6ft. 8in.*
Wing area	*178 sq. ft.*

VERY similar to the Taylorcraft as produced in America, the Piper L-59A is another of the new Grasshopper class now extensively used by the U.S. Army for liaison, many of which are to be seen in this country. The type was at first designated by the letter O, but this was changed to L when the term "liaison" was introduced into the U.S. Army Air Force classifications to differentiate between the Grasshoppers and the full-sized observation types such as the Curtiss Owl (0-52).

Incidentally the similarity between the Piper and the Taylorcraft is not very surprising when one remembers that the Piper Aircraft Corporation sprang from a reorganisation, in 1937, of the original Taylor Aircraft Co.

The L159A is a development of the Piper Cub J-3 trainer, and its two seats are arranged in tandem. The Cub has been extensively used in America's Civil Pilot Training Programme and it was the excellent performance of this little machine during the U.S. Army manœuvres in 1941 which resulted in the firm's receiving large orders for the type; the L-59A has been in service since early in 1942.

It differs from the Cub in having an extended cockpit aft of the trailing-edge of the wing, giving better visibility for the observer who, in one version, can swivel his seat round to sit back-to-back with the pilot and work as a radio operator. Either a Lycoming or Continental "flat-four" air-cooled engine of 65 h.p. is fitted and, like all Grass hoppers, the L-59A can "hop" in and out of almost any small meadow, while the average road provides a ready-made runway.

The externally braced high wings of the Piper are built up of spruce spars and aluminium-alloy ribs with fabric covering. The fuselage is a welded steel tube structure, also fabric covered, and so is the tail unit.

Top speed is 92 m.p.h., cruising speed about 80 m.p.h., service ceiling 12,000ft., and range 260 miles. Like all Grasshoppers, its landing speed is a mere 35 m.p.h. The Pipe 59A may be distinguished most readily from the Taylorcraft L-57 by its elliptical tailplane and by the fact that on the Piper the base of the "V" struts meets the fuselage aft of the undercarriage fairing.

A26

Everything depends on Accuracy

SMITH'S
AIRCRAFT
INSTRUMENTS

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

High-speed Camera

GERMAN engineers claim to have built a camera capable of taking 3,000,000 pictures in one second. To make this possible a very intense source of light was needed, and an electric spark is used for this purpose. The new invention is of special importance for photographing flying bullets. As the latter cover about 1,000 metres per second, three pictures can be made of each millimetre they travel. Such pictures should reveal interesting details about the air waves they set in motion.

Wanted : Exaltation

ON the occasion of the twentieth anniversary of the *Regia* the national centre for aviation propaganda opened three competitions for poets, painters and musicians. For a musical symphonic work inspired by the Air Force, and for a painting exalting the Air Force, a prize of 20,000 lire is offered. The same amount will be given to the best poem exalting the work of the *Regia*.

It is to be regretted that wartime regulations prohibit correspondence with Italy, otherwise some of our readers could have perhaps expressed poetically their views on Italy's air arm.

Appointment

INFORMATION in the German Press reveals that General der Flieger Fischer is now C.-in-C. of a Luftgau (Air Command District) on the Eastern Front.

From Japan

WITH the growing need for machine tools, a complete reorganisation of this branch of production is now reported from Japan.

The Mitsubishi concern is planning the establishment of a central machine-tool factory exclusively devoted to the needs of the army. Considerable expenditure is announced for this purpose, and a new company will be formed by the amalgamation of four other companies of the Mitsubishi group.

It is significant that the new measures do not imply the creation of new production facilities, but rather a centralisation and better exploitation of the existing resources.

Another report from Tokyo says that Japanese engineers have just made an important discovery in the aluminium field. The Showa Company, which at present produces the largest quantity of aluminium in Japan, is credited with the development of a new method of production. Hitherto about three tons of coal and 500 kilowatts of electricity were needed to work 2½ tons of bauxite. The new Showa system is said to introduce a saving of 40 per cent. of coal and 50 per cent. of electric power.

Discovery

A REPORT from Bucharest states that molybdenum has been discovered in Rumania. It is said that the results of the analysis have been so successful that measures are immediately to be taken for the exploitation of this new source.

Aircraft and U-boat

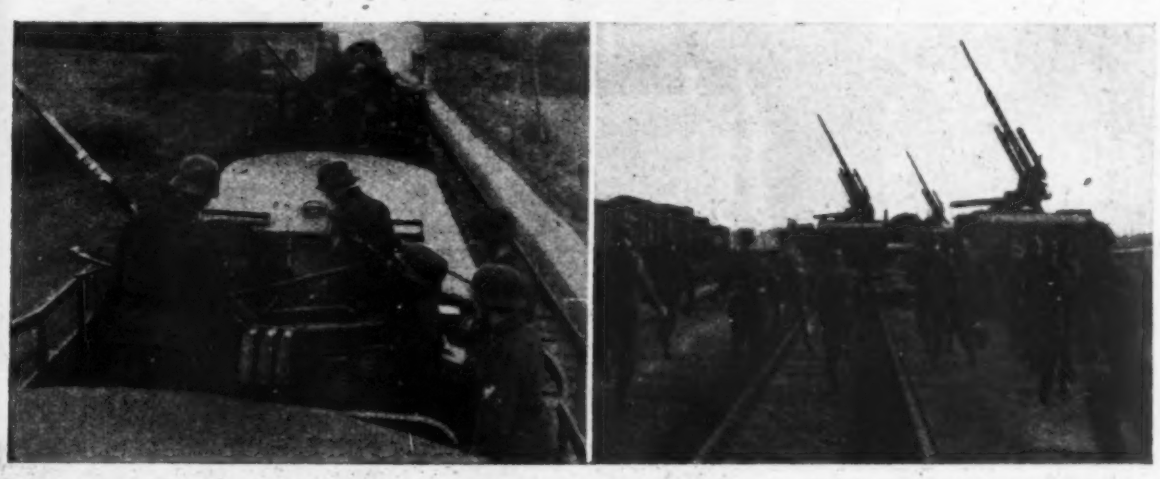
DISCUSSING the influence of the air weapon on the development of submarine warfare, a German commentator expresses the view that aircraft reconnaissance cannot produce the expected results because of the immense expanse of the oceans, leaving necessarily huge areas unpatrolled. Nevertheless, it is recognised that "the aircraft within the limits of its range is a serious danger to submarines, mainly based on the speed of the aircraft, the possibility to appear suddenly and the speed of attack—factors all ranged against the diving speed of the vulnerable submarine." The tying down of substantial numbers of Allied aircraft engaged in anti-submarine operations is, according to the German writer, another of the paralysing functions of the U-boat which is frequently overlooked.

In offensive operations the aircraft can render valuable service to the submarine. "Land-based aircraft," it is said, "have a superiority over ships in the approaches to the coast and in narrow waters, a fact which has become one of the main principles of the conduct of present-day naval warfare."

An interesting sidelight on the operational capacity of the *Luftwaffe* is provided by the author's statement that despite excellent results with flying boats and long-range bombers obtained during 1940 and in the beginning of 1941, their co-operation with U-boats had to be largely discontinued because of the urgent calls on such aircraft on the Russian front and in the North Sea sector.

In the words of the German writer, "because of these other calls the *Luftwaffe* has for the moment more or less retired from this particular sphere of action, and is devoting its attention mainly to protecting U-boats as they enter and leave the Bay of Biscay. As soon, however, as the fighting on the Eastern front has to some extent died down, the co-operation with submarines will be resumed on a very much larger scale and on the lines tried out in 1940 and 1941."

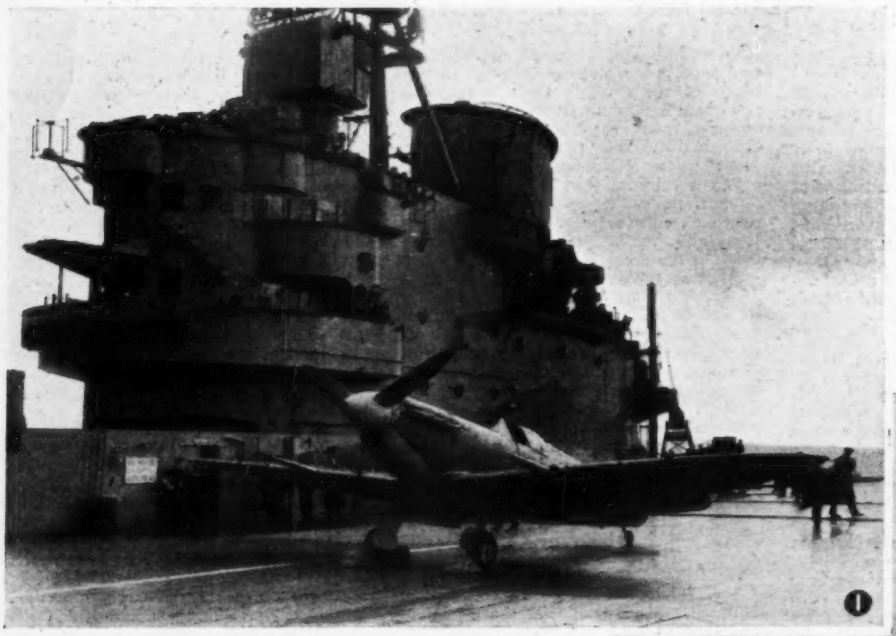
With the ever-growing strain on *Luftwaffe* resources it is thus significant that a German source should acknowledge the *Luftwaffe's* impotence to keep up simultaneous operations in the different fields of action.



DEFENSIVE OUTFIT : With the growing R.A.F. offensive the Germans have adopted the "Flak train." Small-calibre guns are carried to protect goods trains and 88mm. A.A. guns are mounted on railway trucks to give them more mobility. Similar trains have been used by the Russians for some long while.

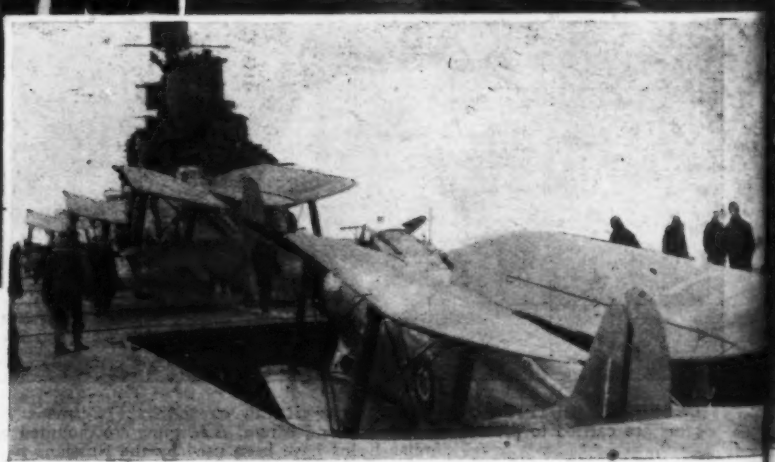
H.M.S. *Indomitable*

23,000 TON AIRCRAFT CARRIER ON ACTIVE SERVICE

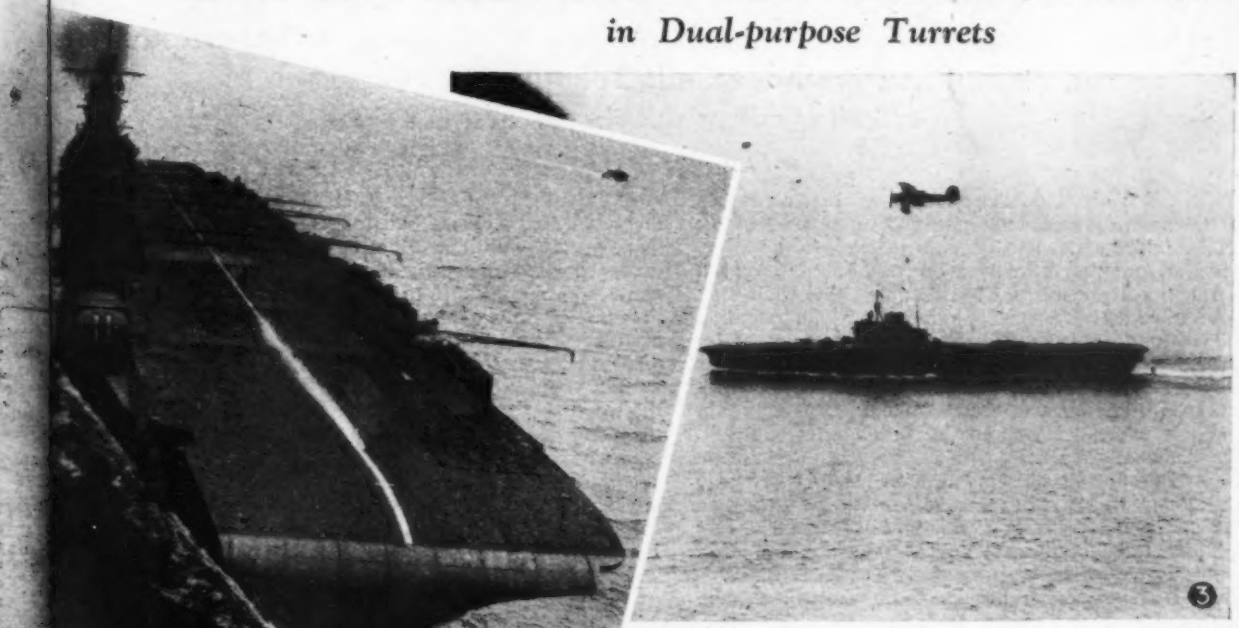


1. A twin-cannon Seafire standing by the control "island" on the starboard side of H.M.S. *Indomitable*. The ship is obviously not under way. If it were the chocks would be behind the wheels.
4. The flying control officer signals a Seafire pilot to cut his engine and pick up the arrester wires.

5. An "asbestos man" is always available during flying in event of a burn-up.
6. Lifts on all the carriers since the *Ark Royal* have had square openings. The previous lifts were cruciform to take unfolded fighters.



One of Our Newest Aircraft Carriers at Sea : A Floating Home for Seafires and Torpedo Aircraft : Main Armament of Twin Guns in Dual-purpose Turrets



2. Modern design of carriers retains the navigating and fire control island on the starboard side of the flight deck but leaves a clear run for aircraft. The steam jet to show direction of wind is farther back than in the earlier ships.

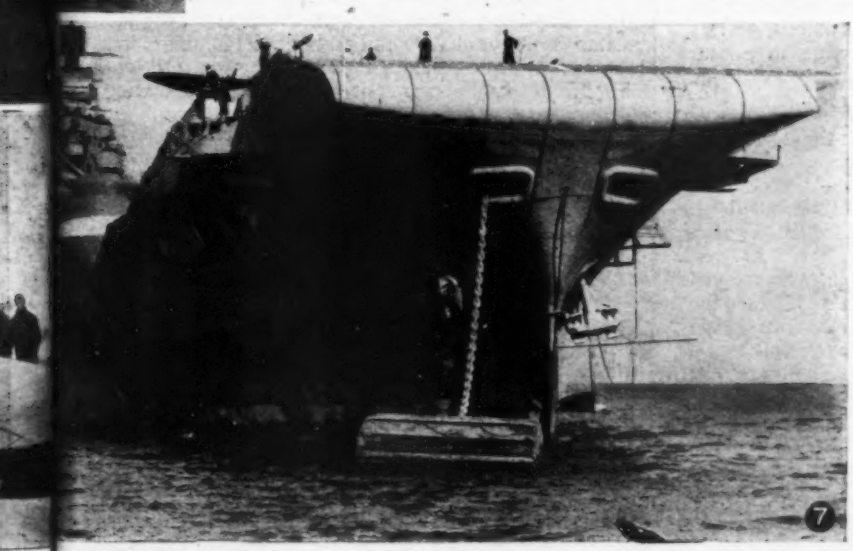
3. Old wine in new bottles—a Swordfish over the *Indomitable.*

AT the outbreak of war the Royal Navy had seven aircraft carriers in commission and a further five on the stocks. Of the seven then in being we have lost the three best ships: H.M.S. *Glorious, Courageous* and *Ark Royal,* but these have been more than replaced by the addition of H.M.S. *Illustrious, Victorious, Formidable* and *Indomitable.* The fifth carrier building at the outbreak of war was H.M.S. *Implacable,* but no mention of it being in commission has yet been made. These do not represent the complete number of carriers in service with the Royal Navy, because a number of merchantmen have been converted for operational use with convoys.

No very detailed information is available of the new ships. It is known, however, that they are all of 23,000 tons standard displacement—1,000 tons larger than the *Ark Royal*—and have a maximum speed of about 30 knots. This speed is ample for the carriers to keep up in a fleet action, and for maintaining sufficient airflow over the flight deck in a dead calm. The *Illustrious* and *Victorious* are Vickers-built and have turbines developing 111,000 h.p. each.

For main armament these two ships were designed to carry sixteen 4.5 in. guns in dual turrets, and 20 smaller weapons. It is certain that a number of multiple pom-poms—or "Chicago pianos" have been installed.

H.M.S. *Formidable* and *Indomitable* were built by Harland and Wolff and Vickers-Armstrongs respectively, but no details are available for publication.



7. No aircraft carrier is a beautiful ship, but the naval architects are gradually evolving a type which blends both efficiency and "lines."

Notes from a Test Pilot's Diary—5

Aileron Control

Differences Between Fabric and Metal-covered Surfaces : Importance of Manufacturing to Small Tolerances : Terminal-velocity Dives the Real Test

By "WITNESS"

GOOD ailerons do more than any other control to make a pilot feel at home in an aircraft. A heavy rudder and elevators which tend to be over-balanced for small movements are easily forgotten, even in a fighter, if the ailerons feel "right." The view used to be taken that heaviness of aileron control in a bomber did not matter, provided that stability was good, and a steady course could be maintained without the need for frequent corrections by the pilot. But this war, in which four-engined bombers are expected to dive at 400 m.p.h. and be capable of violent evasive action during the pull-out, has changed our ideas in this respect.

Series-production of every type of machine of which I have ever had experience indicates that, whilst it may be easy enough to build a prototype with good aileron control, manufacture in quantity produces entirely new problems. No other control surface is so sensitive to small discrepancies in profile, gap and fit of shroud. With the general tendency to change from the fabric-covered aileron, in which the tension of the fabric could not be guaranteed to be reproduced at a constant value, to the metal-covered type, we had reason to hope that much of our trouble would vanish. But metal-skinning has not turned out to give such an exact similarity of surface that fairly big aerodynamic differences are not discernible amongst metal-covered ailerons.

At the same time, it must be acknowledged that the metal covering does generally give a stiffer aileron, and one with lighter handling characteristics, than fabric. Obviously, if it were practicable to manufacture to sufficiently small tolerances, metal-covered wings and ailerons could be produced with such accuracy that the test pilot would never have to call for an aileron change. As things are, the test pilot must set his own standard of what, for the particular type of machine he tests, may be passed in the way of snatch or overbalance, and at what stage the ailerons are so heavy as to be an embarrassment in manœuvre.

T.V. Dive Test

The only test which proves the ailerons throughout the speed range is the dive to the limiting speed of the aircraft. In extreme cases of overbalance, the ailerons may snatch so badly on the climb or during a full-throttle level flight that a dive is out of the question. Also, if a machine is trimming extremely one-wing-low, it may be impracticable to attempt a dive. But in ordinary circumstances the dive will be the real test of whether the ailerons are satisfactory or call for adjustments. The ailerons should be worked throughout their full travel as the aircraft is allowed to accelerate gradually up to its maximum. This needs considerable strength on some types, and there was one fighter with fabric-covered surfaces which often required both hands. Incidentally, with fabric one can sometimes improve a snatching tendency by carrying out several dives, due to the stretching of the fabric with reapplied load.

When checking the lateral trim, whether in the dive or in any other condition of flight, the need for preventing yaw seems obvious, but it is sometimes overlooked. Quite apart from the fact that yaw in the dive produces excessive side loads on the tail unit, I have come across more than one instance of a test pilot being bewildered because he found that, for no apparent reason, a machine which had trimmed satisfactorily on one flight seemed to have become left-wing-low the next time he flew it. A careful investigation of how he had flown the machine revealed that on the second flight he had not noticed whether the sideslip hand of the turn-and-bank indicator had been central. When it had been explained that by flying with yaw one could automatically make a machine one-wing-low, he soon proved to his own satisfaction that by trimming his rudder to eliminate skid, he could get the machine to fly level without lateral pressure on the stick.

Curing Overbalance

The causes of overbalance and heaviness will vary to some extent according to the particular type. On one machine it may be permissible to thicken the trailing-edges of the ailerons by doping the same length of cord above and below on both sides, in order to cure snatch. On another the normal method is to increase slightly the down-droop of the ailerons, which will tend to hold the aileron-noses up into the wing and so reduce the effectiveness of the balance. Aerodynamic heaviness can only be cured, short of changing ailerons, by giving the ailerons a small amount of negative droop, or by closing up the gap if the design makes this possible.

Sometimes it is difficult to differentiate between mechanical stiffness and aerodynamic heaviness. Just because the ailerons are free to move on the ground, it does not follow that excessive mechanical loads will not be felt when the wing flexes, as flex it must, under the loads imposed by the dive and pull-out. It is, therefore, always worth while checking the run of the controls, tensioning and possible causes of fouling before assuming that the aileron surfaces are the root-cause of heaviness.

MASTER PILOT'S TICKET FOR CAPT. LORAINE

CAPT. A. C. LORAINE, of British Overseas Airways Corporation Atlantic services, has been awarded the Air Ministry Master Pilot's Certificate No. 1 of Series 2, valid for land and marine aircraft. Master Pilot's Certificate No. 1 of Series 1 was awarded to Capt. L. A. Walters, now Flying Establishment Officer of the Corporation, on February 15th, 1934.

The principal difference between Series 1 and 2 is that a 1st Class Air Navigator's Licence must be held to qualify for the latter. Capt. Loraine was previously awarded No. 19 of Series 1 on July 10th, 1936, valid for landplanes.

Capt. Loraine was second in command of the flying-boats on which the Prime Minister made three crossings of the Atlantic.

It will also be recalled that Capt. Loraine made a dramatic flight, without radio or weather reports, to West Africa after the fall of France, and the entry of Italy in the war had resulted in the closing of the Mediterranean to civil aircraft.

International Air Transport

The Future Safeguarded Only Through Whole-hearted Co-ordination with Existing Surface Transport

By A. KUNZLER

TWENTY years ago the cost of air transport on one ton of goods for a distance of 200 miles might have been about £100, requiring two or more aircraft. When this war is over we must expect that for the same sum a single machine will carry 5 tons for a longer distance. One single aircraft might carry 100 tons in a few years' time, comprising packages of great bulk and individual weights. With the continuous technical progress in aviation the pay-load will tend to approach the pay-load of surface transport, but whatever the progress, it must be realised that the cost per ton per mile (taking all overhead expenses into consideration) will hardly ever come down to the level of surface transport.

In wartime cost is of little or no importance provided the object is achieved. In the first few years following this war the urgency of transferring certain cargoes to the exhausted and overrun countries will naturally cause an extraordinary demand for air transport for obvious reasons. However, as the years go by the various means of international transport will find their true levels determined by the laws of international commerce. Economy in cost of transport will be the first consideration everywhere.

THE writer of this article has had wide experience of international transport, particularly between the United Kingdom and the different European countries. He thus approaches the subject of air transport from a different angle, seeing it not as a separate system of transport but as one aspect of the general transport problem. Only by co-ordinating all forms of transport, he argues, can full advantage be taken of each.

The chief advantage which air transport can offer against surface transport is obviously speedier delivery, and this has secured it certain urgent traffics, particularly newspapers and mails. Also highly valuable cargoes, perishables and plants, etc. The last two are likely to reach their destinations in a satisfactory condition only if sent by air.

Another advantage of air transport may be the saving of special packing and the lesser risk of theft and pilferage in cases where the carrying aircraft happens to go to an airport immediately serving the ultimate destination. Lastly there may be the traffic of spare parts and accessories urgently needed for the upkeep or running of industrial plant, etc., where even a few hours' saving in transport time may make all the difference. Apart from newspapers, mails and perishables, it may be said that the bulk of the traffic consists of small parcels. It may be added that the advantage of the lesser war risk by air transport after the war will be of a temperary nature only.

Basic Air Traffic

Of the above-mentioned traffics the daily newspapers and the mails obviously form the basic traffic by air, where the total annual quantity can be roughly gauged. As to the other traffics, it is impossible even to make an estimate, particularly as after the war the exchange of goods may not necessarily move on similar lines as before the war through the creation of new centres of industry. Perishables, including fruit, flowers, fish, etc., are seasonable and subject to other factors which may make it impossible to gauge the tonnage.

In many cases there is no return traffic. It is probably no exaggeration to say that the total of what may be called "typical" air traffic per annum in the European sphere would only be a small fraction of the total tonnage moving by all the various means of transport.

Now the vital question arises as to what revenue would be secured on the basis of the above-mentioned "typical" air traffic; also what additional revenue might be secured on traffics which could not be secured up to 1939, but may be secured after this war in view of the considerably larger loading space on future modern transport aircraft.

Let us assume that no subsidies will exist, apart from payments by the Government for mail contracts. Here we come up against a factor which is almost entirely ignored by many people, some of whom have suffered heavy financial losses by opening up new air services on what were considered to be promising fields of aerial transport. The freights which air transport has been able to secure in the past, and is likely to secure in the future, are related to the existing rates by surface transport services even on such traffic as is considered to be "typical" air traffic.

Now the existing sea-freights and rail tariffs within the European sphere were evolved as a result of many years of experience and careful and scientific planning. The rates which were, and still are, charged are those which it is considered that the traffic can reasonably pay, taking a number of other factors into consideration.

The Continental railways (virtually all national) have invested a lot of money in their systems and employ much labour, and will stop at nothing to secure valuable revenue for their services. The subject of European rail tariffs is far too involved to go into here and would fill a large volume. Suffice it to say that for urgent traffic the existing schedules of carriage for transport by the fastest passenger services are mostly lower than the cost rates which the air companies would arrive at, even excluding any profit.

Surface Competition

In a fight to secure traffic by the process of cutting rates the last word would always rest with the surface interests, with the lowest actual cost of haulage per ton per mile. In the past it has been proved that reductions in freights did not create new traffic, but simply reduced the existing revenue on traffic carried by all routes.

Here again it must be remembered that, with a few exceptions, the chief European industrial centres are within a radius which permits transit overnight by surface transport. Further, there exist various alternative slower services by rail and road where the basic rate on general traffic might go down to under £4 per ton between the chief centres. Even if it will take up to a week in transit against a few hours by air, cheapness invariably receives first consideration.

The position between air and surface transport is quite different outside Europe by reason of the considerably greater distances involved, where not days, but weeks can be saved in delivery by air, or where surface transport is not satisfactory at all times. But even in regard to these transcontinental or transoceanic services it should be borne in mind that where the chief commercial centres can be reached without incurring any or much inland transport at either end, as is the case between New York, Rio de Janeiro and Buenos Aires and the Western European capitals, the practical advantage of commercial air transport has its limits. The initial enormous demand for air space immediately after the war cannot serve as a criterion.

After considering all these points, one particular aspect

should be emphasised, namely, the vital necessity of considering this matter of international communication, or rather transport, not as separate issues, one air, another shipping, and a third rail and/or road, but all as one composite subject. If necessity demands that all be co-ordinated in wartime there is an even stronger case for continuing so in peacetime. However, if air transport is treated as a separate issue and the planning for the future is left to those who fail to see the merits of the other means of transport, then we are heading for chaos, which will lead to political differences and complications such as we saw by 1939.

To satisfy the social and economic requirements of post-war Europe it might be found that the number of modern transport aircraft required in this restricted field will be considerably smaller than is generally expected. When even the world requirements may well be satisfied by using only a fraction of the existing combined building capacity of the U.S.A., the British Empire and Russia, then it would appear that the promised better world depends upon whole-hearted collaboration.

Now is the golden opportunity for the Governments of the United Nations to establish new rules for international carriage by air. The I.A.T.A. regulations, as well as the "Carriage by Air Act, 1932," require to be overhauled. Amongst other items consideration must be given to the fixing and publication of schedules of rates of carriage, the regulation of private charter, restrictions on the running of privately owned aircraft, etc.

So far as Europe is concerned, when, in consultation with the surface services, the approximate requirements for air services are fixed, it may be found that there is room only for one licensed company in each country to run the required services to and from the other European countries. To secure for the various participating nations a just and reasonable revenue, pooling, through international clearing, might be the best means of procedure, taking into consideration the fact that large countries have larger commitments.

Certainly air transport will play a vital role indeed in the future. All the more is it our duty to build up in a sure way and on sound lines, so that our promises and obligations to the men of the air can be carried out, not only for the first few years after the war.

In Parliament

New B.O.A. "Part-time" Board Criticised : Co-operation with America

MR. GRANVILLE (Eye): I desire to raise the question of civil aviation, with special reference to the recomposition of the board of British Overseas Airways Corporation and also the designing of prototypes for post-war air liners. British Overseas Airways Corporation was set up before the war, under the chairmanship of Sir John Reith, on the principle that if you roll everything together you will get something approaching a white elephant.

Before this Corporation was formed we had in civil aviation in this country Imperial Airways, British Airways and a number of independent companies. Imperial Airways were responsible for the overseas sea routes, the Empire routes, which were flown mostly with Empire flying-boats. They were also responsible for the North Atlantic route. British Airways were responsible for the land-based routes in Europe, and towards the end of their time they were allotted the South Atlantic route. Then all these companies were lumped together as British Overseas Airways Corporation.

I opposed the formation of that monopoly. I believe we should have a certain amount of enterprise in civil aviation, not only some competition between routes but some competition and enterprise between land-based aircraft and flying boats. What civil aviation has suffered from in recent years is the fact that they have had people pushed on to them who know nothing whatever about civil aviation. Accountants, lawyers, bankers, B.B.C. officials—all have sent their quota to be responsible for the supreme direction of one of the great transport services in the British Empire.

New Board "Depressing"

Now the right hon. Gentleman the Secretary of State for Air has announced a new board with a certain number of what I would call part-time business men on it. I am bound to say the reception which has been given to this announcement, as was referred to by my hon. Friend the Member for Duddeston (Mr. Simmonds) in a question which he asked the right hon. Gentleman to-day, is a very disturbing one, and it has had a depressing effect not only upon civil aviation and the aircraft industry but upon the public generally, who have themselves taken a tremendous interest in the future of civil aviation after the war.

None of us has anything against Mr. Simon Marks or Mr. Marchbanks or the Chairman. They are eminent men with honourable careers behind them, but this is not a chain store or a railway or an ordinary business. The work of this Corporation is to plan and organise the airways system of the British Empire, and I submit that that requires a knowledge of aircraft, of flying boats, of airports, of radio and of flying, and I do not believe that some of these directors are even what is called "air-minded."

I have tried to intervene in civil aviation Debates in this House for some time because I hold strong views on the future of air transport. We are the greatest oceanic Commonwealth in history, and I believe we shall have to be an air Commonwealth after this war. I hold the view that this question must be seen with an imagination which envisages services every day to India, Australia, Canada and Africa, to reach these places in two days, using perhaps some place like Hyde Park as a central European terminus. And, of course, these services would have to be flown back from overseas and Dominion airports. We have an aircraft industry to-day which the Minister of Aircraft Production has told us is now the largest industry in the country.

Switch-over to Civil Types

Whatever plans for industrial demobilisation the Government may have, the switch over in this industry will depend very largely on the plans which the Government make to design and produce aircraft for civil aviation. We may have to feed Europe immediately after the war by means of relief aircraft. We may have a situation in which shipping, for some of the lighter freights, will be superseded by air freighters.

In addition to that, there will be thousands of young men, the heroes of the Royal Air Force, wanting to make a career in the skies. In my view, in civil aviation will be found the industry, the career and the transport of the future. Unless we plan the future air transport from these Islands on the basis of a great air commonwealth, I am bound to say from my experience that we shall be relegated to the position of a second-class civil air Power.

I want to make a suggestion to the right hon. Gentleman. I had something to do with civil aviation through British Airways. I believe this thing is bigger than a company with a board of directors in this country. I believe there are men in the Empire—I wish I had more time to develop this subject—in places like Australia and Canada and South Africa who have experience and knowledge of civil flying. Unfortunately, some of them have turned a good deal to America.

Why not call together a board of these men and constitute a Commonwealth Air Board now, representative of the British Commonwealth of Nations? Set up this board now, and for committee meetings let them meet in an aircraft and not in any circumstances in a Government Department. Government Departments and Committees have been "gremlins" of the development of civil aviation.

The right hon. Gentleman has referred to this question as international dynamite. I agree that if you leave this matter to unbridled competition it has all the potentialities of international dynamite, but why leave it to competition? Why not start now discussions among the United Nations on methods and ideas of co-operation? Before the war we were using American Lockheed 14's for many of our European services. It is true that America is a long way ahead of this country in the development of civil aviation. I am told that the major

concerns in the U.S.A. have a prototype of post-war civil aircraft either on the drawing board or actually in production. I believe that one vast concern has a designing staff larger than the whole of the industry in this country.

The right hon. Gentleman must bear in mind that it takes at least four or five years to produce a prototype. We do not want to compete with America, but to try to get the fullest co-operation with the U.S.A. At the present time there is between the United Nations the most complete exchange of all technical information on military aircraft. Why not begin now, within the United Nations, to exchange information on technical development on civil aircraft design and such information as we have available on designs and ideas for fuel economy, safety devices, etc.?

There is much that America could give us on safety devices and the rest of it. Why not accept the precedent we have accepted about military equipment? Instead of talking about unbridled competition after the war, why not begin to effect this co-operation with America and exchange all technical information about post-war civil aviation prototypes? If we do that, it means that this country has a part to play.

I hope the right hon. Gentleman is not going to tell us that we are going to aim at the programme or plan which has been announced by him in this House and discussed, I believe, for some time by the Under-Secretary. I hope he is not going to tell us that the extent of the target that the Government have in mind or are aiming at is 400 or 500 air liners after the war on the basis of the production of 100 a year. Surely we should envisage a programme sufficiently large to enable a great part of the present aircraft industry, with its research departments, laboratories, technical staffs, to turn over after the war to the production of civil air liners.

A World Air Line

In the same way the United Nations must aim at a civil air federation and eventually at something in the nature of a world air line. If you are to have an international police force after the war, well, the *Lufthansa* was the father of the *Luftwaffe*. You will need to have inspection, there will have to be supervision, and therefore I cannot, for the life of me, see how we can possibly envisage a great world development in civil aviation without the closest co-operation not only on the basis of the British Commonwealth but between the United Nations. I hope the right hon. Gentleman will be able to give us some ray of light to-day that the Government plans have this in mind.

I know that a certain number of people have been advocating that civil aviation should be handed over to another Department. I do not know whether my right hon. Friend is too busy. I do not know, I am not qualified to say, whether this should be taken away from the Secretary of State for Air and put in charge of the Minister of Transport or someone else. All I beg the Government to realise is that the public of this country is determined that the progress of post-war civil aviation is going to be on a great, not a small, scale. I would appeal to the right hon. Gentleman that if he is too busy and if the Under-Secretary is too busy then some other Ministry should be used, or a Ministry should be set up to deal with this question.

Mr. Simmonds (Birmingham, Duddeston): My hon. Friend made a very important reference to international control, but I thought his remark a little ambiguous. Would he be quite specific? He is not in any way suggesting an international aircraft-operating organisation, is he?

Mr. Granville: I notice that an American authority said in yesterday's papers that we may have to apportion machines and traffic, possibly on the basis of the number of people using them from each country. I do not know. I do not visualise at once one great air line. I want, first of all, that the Commonwealth should organise itself as an air unit, and set up its air lines, and then get some exchange of information and co-operation between the United Nations. You must have a basis of civil air federation if you are going to have an international police force which envisages supervision and inspection. Otherwise, the mails and passengers go out, and the bomb-racks come in. If there is to be this co-operation, then one day we must expect to see one great world air line.

Mr. Montague (Islington, West): The hon. Member for Duddeston (Mr. Simmonds) seems to be very anxious to head off the idea of international civil aviation.

Mr. Simmonds: International air line operation.

Mr. Montague: I meant aviation in that sense. May I underline a point made by the hon. Member for Eye (Mr. Granville), when he said that the *Lufthansa* was the father of the *Luftwaffe?* If that is true, and if we have to prevent the development of national air forces of an aggressive character we must look upon not only military aviation but also civil aviation from the point of view of international needs and international necessities. At any rate, I do not suggest that it will be possible immediately, but sooner or later we must realise the international aspect of the air itself, the fact that there are no boundaries in the air, and that all those problems have to be solved internationally some way or other; and that must come down to the operational field just as much as to the manufacturing field.

The Secretary of State for Air (*Sir Archibald Sinclair*): I cannot help regretting, and I am sure the hon. Member for Eye (Mr. Granville) will understand why I say so, that he should have made this attack upon the members of the British Overseas Airways Corporation. This Corporation is doing an invaluable job of work in the war. Its services are of the greatest war value. It is vital that it should be kept going, efficiently and strongly. The former members of the Corporation found themselves in disagreement with me on an important point of policy, and they resigned quite suddenly, all except one.

I was fortunate enough to find three other gentlemen to join with the member who did not resign. They came forward willingly, stepped into the breach, and have since applied themselves to the job with assiduity. They have been constantly on the job, and I can assure the hon. Gentleman that if he will make inquiries from those most closely concerned, he will find that they have already won the respect of those with whom they work.

It is quite true, as I told the House of Commons, that the chairman whom I have appointed is only appointed temporarily. I intend—and I feel sure I shall carry Members with me in this—to find as chairman for this extremely important post a man who will give his whole time, or at any rate almost his whole time, to the work of this Corporation. I cannot ask the distinguished gentleman who is now temporarily holding the post of chairman, but I think I can carry the House of Commons with me this step farther. I am sure that they will understand that it is not easy to find a man of the stamp for whom I am looking.

Mr. Beverley Baxter (Wood Green): Surely the right hon. Gentleman would not have us believe that, when the permanent chairman is appointed, it can possibly be anything but a full-time job. He says almost a full-time job, but surely it must be full time plus, if such a thing exists?

Sir A. Sinclair: In view of the difficulties with which I am faced in finding men of the right stamp, especially in wartime, I do not want to give a firm pledge to which the house would be entitled to hold me. I should like to be able to take a man of outstanding mark if he should stipulate that he must give some little time to another matter which would have no conflicting interest; but I want to find a full-time man if possible It is not easy in wartime, because most men of the stamp that I would like to engage are engaged on important wartime duties from which it is difficult to spare them. I shall not allow the grass to grow under my feet in searching for a man, but I want to take a reasonable time before I make my decision.

The Practical Approach

The hon. Member for Eye turned on to an interesting proposal for a commonwealth aviation board. I am not quite sure exactly what he had in his mind. It is within his knowledge and the knowledge of other hon. Members that the British Overseas Airways Corporation was created by legislation by this Parliament and is financed by the taxpayers of this country. It would be anomalous to appoint to the Board representatives of Dominion Governments who would have no statutory or financial responsibility for the board. The practical approach to imperial collaboration is a joint operating company to operate certain routes.

It is an interesting suggestion, however, that we should in future reconstitute the British Overseas Airways Corporation as a truly Imperial body financed and founded by the different Governments of the Empire. That is a very big question—I dealt with the larger and fundamental issues in my speech on the Air Estimates—and it would have to be considered in relation to large issues of international policy and to the problem of international co-operation after the war.

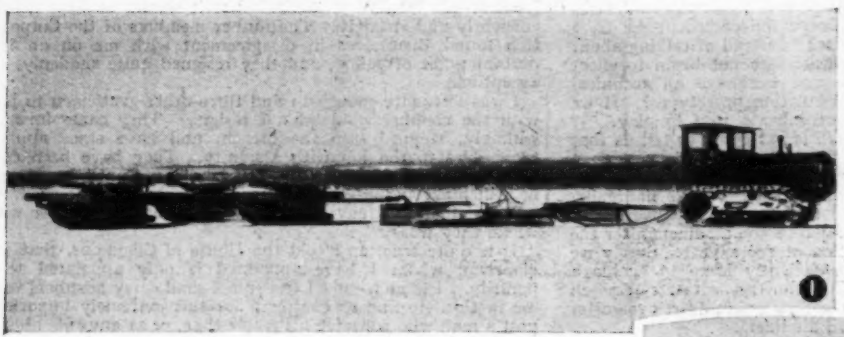
I would only say, in conclusion, that we are giving most careful thought and study to the larger problems of the future organisation of international civil air transport, to which my hon. Friend referred.

I agreed with a great deal of what he said, with the exception, perhaps, of his suggestion of Hyde Park as the terminal for international air services after the war.

The House and the Government are determined that, in whatever form we are called upon to play our part in world air transport after the war, that part will be one which will be worthy of this country and the Empire.

Winter Airfields in Canada

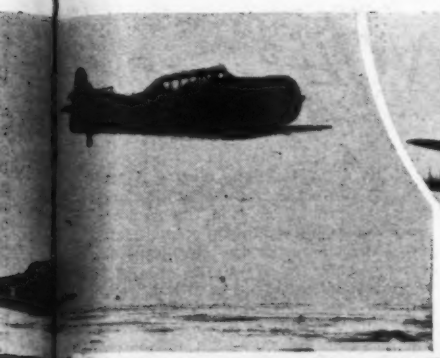
Maintaining Runways in Deep Snow and Temperatures of 40° Below : Training Plan Never Weatherbound



1. A caterpillar tractor scarifying and rolling an airfield surface.

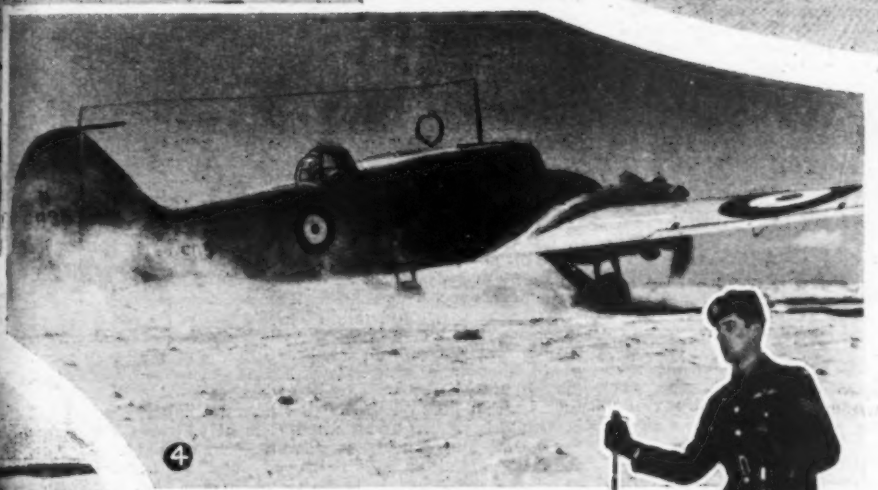
IT is an essential feature of the building up of our air power that the Commonwealth Joint Air Training Plan should go on throughout the year without interruption. Not the least problem to be solved is the maintenance of usable airfields during the Canadian winter. Deep snow and very low temperatures make this a difficult job, but it has been overcome by the extensive use of mechanical snow-fighting equipment. Powerful snow-blowers clear the roads and runways of loose snow, and heavy rollers drawn by tractors consolidate the surface. The modern retractable undercarriage has almost put a stop to the use of skis for winter flying, which was once quite common.

7. A snow-blower at work clearing the loose surface of a runway. 8. Filling lorries with snow by the aid of a mechanical snow-loader. 9. Levelling deep snow-drifts by means of a bulldozer.



2. Harvards flying over snow-covered and wooded Canadian countryside.

3. A Canadian-built Bristol Bolingbroke on the runway. From the tyre tread marks it appears as if a reasonable non-skid surface is obtained.



4. An Avro Anson creates a private blizzard as it runs up its Cheetah engines.

5. Fairey Battles—now used for training—standing out in all weathers. The fence in the foreground is a measure of defence against snow-drifts forming.

6. Training in Canada is not all work and flying. The snow, which is such a nuisance on the airfields, provides plenty of good fun.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

RANGE CALCULATION

Weight or Volume of Fuel?

REFERRING to the letter of "Pint Pot" in your issue of March 11th on the variation in the specific gravity of petrol, it would seem that a difference of 5 per cent., which was quoted, is an excessive figure. It is true, however, that a variation of 2 to 3 per cent. is met with, and I have awaited with interest some reply to the pertinent question raised in the letter.

Fuel-consumption figures for engines under test are usually given in lb./b.h.p./hr., and it would seem that in the calculation of engine performance at least the weight of fuel, as distinct from its volume, is of some importance.

Can one assume that in operational service this factor is of no importance?

F. M.

MEN TO REMEMBER

No Ribbon After 29 Years' Service

I HAVE just read with interest the letter from "Justice" on the above subject.

As one who served in the R.F.C. from 1917 and carried on in the R.A.F. until this war, I have no ribbons because my specialist duties kept me in England during the whole of the last war from September, 1914.

A pal of mine who served in the R.N.A.S. at the Crystal Palace has a ribbon!

This anomaly in the R.A.F. has puzzled me during my whole 26 years' service, mixing as I have done with ex-R.N.A.S. people for whom 28 days' embodied service entitled them to a medal even if that were in a depot ship or a shore base

I agree with "Justice." We don't want a medal—yet—but at least something to show and remove a possible inferiority complex. The Victory ribbon would give this to us and enable some of us to wear the emblem of a "mention" gained then, and make the "mention" in this war something more real.

It is an amazing thing that rankers get a long-service medal, the A.A.F. and R.A.F.V.R. get one after ten years' service, postmen get the Imperial Service Medal, Civil Servants the Imperial Service Order and R.N.A.S. officers and ratings get a war medal, yet R.F.C. personnel are ignored, as all officers are, even if they serve, as I have done, for 29 years.

Actually I have 29 years' service to my credit, yet in the mess on the day of the 25th anniversary I had nothing but grey hairs to show for it.

We may understand, but the public do not. A lady recently asked me, "How do you like being in the R.A.F.?" thinking I had just joined up!

"1914-1943."

TAILPLANE DIHEDRAL

Some Points of Interest

"TAILPLANE DIHEDRAL" has caused several letters to be written in recent issues of *Flight*. May I add my contribution, which includes points of interest not yet brought out and which, I hope, will help to provide the correct answer?

First of all, it must be remembered that the main wing works in "clean" air, while the tailplane is subject to air greatly disturbed after passing over the wing—giving it a downward thrust. Also by the torque of the airscrews and the action of the fuselage itself.

The tailplane must, therefore, be very rigid to guard against tail "flutter"; strut-braced tailplanes can still be seen even on modern streamline machines.

In theory, the best position for the tailplane is definitely high up on the fin so as to keep it clear of the downward disturbed air previously mentioned. The tail unit as a whole is thus able to work with greater effectiveness in cleaner air.

In practice, however, it is not an easy matter (even in these modern days of aircraft advancement) to build the tailplane high up owing to the great rigidity required to avoid "flutter." The narrow fin has not the solid support as compared with the junction of fin and fuselage. The makers of the Whirlwind have, however, found an answer to the problem, and it has proved itself to be satisfactory.

The next best thing is to "lift" the tailplane, giving it an angle of dihedral, thus enabling the same base fixture to be used. This arrangement has been found to ride the airflow better and, in addition, provides greater stability. American Bostons and Havocs, and recent versions of the Beaufighter, are good examples.

It is interesting to note that the Whirlwind is fitted with Fowler-type retractable flaps on the main wings which slide backwards and downwards, thus greatly increasing the air disturbance. This is another reason for the high tailplane.

It will be noted, too, that the tail units of the Lockheed Hudson and Ventura (also fitted with Fowler flaps) are automatically higher than usual owing to the shape of the fuselage and flying attitude.

The Martin Mars flying boat has tailplane dihedral and end-plate twin fins and rudders set at right angles to the tailplane, giving it a rather "bent" appearance.

ERIC W. DAVEY.

IN DEFENCE OF THE DEFIANT

By One Who Knows It

I FEEL compelled to make a few remarks on your "Aircraft Types and Their Characteristics" in *Flight* of February 25th, 1943, concerning the Boulton Paul Defiant.

First, the most outstanding feature of the Defiant's bag of 37 enemy aircraft in one day (one afternoon actually), i.e., that it was accomplished *without loss* was not mentioned. In all, the squadron accounted for 65 enemy aircraft during the period May 12th to May 31st, 1940.

The article goes on to say that after the initial "surprise" of Dunkirk, a much overrated element in the success, the Defiant no longer held any advantage in daylight. In fact, the same squadron later destroyed about 30 enemy aircraft in under a week during the Battle of Britain, after which they were taken off day fighting.

Their losses were admittedly heavier than at Dunkirk, but they were *not* due to the enemy having "got wise" to the Defiant, as is popularly imagined. They were due to the fact that the squadron's original C.O. was killed and his successor was unfamiliar with Defiant tactics.

To say that Defiants were "found useful" as night fighters is rather a misnomer. The machine was originally designed as a night fighter, and as such it was unquestionably found to be considerably more than merely "useful." Until the time they were taken off large-scale night operations the Defiants not only held the record bag of enemy aircraft in one night; they also showed the highest percentage of "kills" per interception, as distinct from damaged and "probables," of all types used.

On the subject of performance I can assure you that the Defiant in its final form is capable of well over 300 m.p.h., that figure being obtained M.I.T.I.s by pilots of my old squadron.

There was no question of new methods of night interception outmoding the Defiant, which was fully equipped with the most up-to-date equipment for night interception. It was never given a fair chance to use the equipment, although it was extremely successful and much practice was carried out with it by my squadron.

It merely remains to express regret at the lack of foresight shown in laying aside a machine which could easily, with slight improvements and given a fair chance, have been a formidable weapon, considering the overwhelming advantages of a manœuvrable single-engined turreted machine over a cumbersome, heavy, though fast aircraft in eliminating the vital factor of overshooting at night.

"EX-DUNKIRK SQUADRON."

THE BEST TYPES OF AIRCRAFT

Thunderbolt and Barracuda Yet Unproved

A CORRESPONDENT, who goes by the *nom-de-plume* "Squita," suggests that our faithful Spitfire is at last out-moded.

I would like to know where "Squita" gets his information. To the best of my knowledge, no "gen" regarding the operational ceiling and the speed of the Thunderbolt has been

CORRESPONDENCE

released. As to the manœuvrability being superior, I doubt it very much. Regarding the armament, I should say that "Squita" had better be careful with his criticisms. Any armament which can sink drifters, motor torpedo-boats, and blow up trains can hardly be called "corny."

In any case, until the Republic P-47 Thunderbolt has proved its ceiling, speed, and manœuvrability, as well as fire power, I suggest that he reserves his opinion. Even if he were correct, it would be no disgrace to the Spitfire, which was designed at a time when the Americans were still playing with "corny" radial-motor fighters of around 300 m.p.h.

Before I give my version of the table of operational aircraft I would say one more thing. In his last paragraph "Squita" says that it is unfair to include the Barracuda in the lists, as we do not know enough about it. He then makes the error of comparing it rather unfavourably with the Grumman Avenger.

Like the Spitfire-Thunderbolt question, I suggest that he waits to see. I do not put forward these views through sheer patriotism, but I believe in the old saying, "Actions speak louder than words."

Here is my table. The heavy bomber category has not been divided into day and night bombers, as I think this savours too much of splitting hairs.

Operation: Type.	Plane.	Nationality
High-altitude fighter	Spitfire IX	British
Medium level and ground-attack fighter	Typhoon	British
Heavy bomber	Lancaster	British
Medium bomber	Dornier 217E	German
Long-range fighter	Beaufighter	British
Long-range fighter-bomber—reco.	Mosquito	British
Army Co-op. reco.-fighter ...	Mustang	U.S.A.
Army Co-op. reco.-bomber ...	Marauder	U.S.A.
Short-range fighter-bomber ...	Hurricane	British
Dive-bomber (Naval or Military)	Helldiver	U.S.A.
Naval fighter	Seafire	British
Reco.—bombing—patrol—flying-boat	Consolidated Model 32	U.S.A.
Shipboard torpedo-bomber ...	Barracuda or Avenger	British U.S.A.
Shore-based torpedo-bomber ...	Beaufort or Wellington	British
Heavy transport	Skymaster	U.S.A.

G. S. HENDERSON.

Fighter or Interceptor Qualities

IN spite of many correspondents' opinions to the contrary, I still think the Spitfire V is a better single-seat fighter than the Typhoon—which is a far better interceptor.

First, I had better make it clear exactly what I meant by these two classes. By single-seat fighter I meant an aircraft of high manœuvrability so that it can get an enemy fighter in the sights. Then it needs moderately heavy armament sufficient to blast the enemy aircraft out of the sky. By interceptor I meant an aircraft particularly suited to destroying bombers.

When a comparison of the two types is made it will be found that the Spitfire is more manœuvrable than the Typhoon—a vital factor in a dogfight.

From what information I have received it seems the Typhoon is faster, more heavily armed and has a greater rate of climb than the Spit. These qualities should make it outstanding as an interceptor.

Could someone let me know a few details about the CW 21B?

Surely the Typhoon is superior to the Mustang as a ground strafer for, being armed with cannon, it gains a decided advantage over the eight m.g.s of the Mustang.

The Beaufort or the Marauder is better than the Beaufighter as a torpedo bomber—the Beaufighter not being able to fly slowly.

The Whirlwind is more manœuvrable than a Mosquito and should prove superior as a long-range escort fighter.

Congratulations on *Flight's* interesting article on "Twenty-five Years of R.A.F."

R. E. GREGORY.

Little Data for Fair Comparison

THE various lists which have been submitted to your columns, purporting to show the best aircraft in various classes, would appear to be of little value. On what grounds have the machines been judged? If the highly optimistic pronouncements put forth by the Air Ministry and emanating from the U.S.A., together with a careful sifting of such performance figures as have appeared in the Press, are all that are available, the various lists are meaningless.

In a representative list taken from your columns, that of Messrs. Dye and Henshaw, the only aircraft for which accurate data are available to any but a few Service personnel and privileged members of the industry, are the Fw 190, Beaufighter, and Short "G" Class, out of a total of 18 aircraft. (By performance data we mean a complete set of figures and not mere approximations to maximum speed, etc., as usually quoted.)

On the other hand, the machines may be compared by their operation capabilities as described in reports by war correspondents and official communiqués. Here we are on somewhat better ground, but again, the meagre quantity of detailed reports makes accurate judgment very difficult.

The performance of a smooth, clean (i.e., unoperational) prototype bears almost no relation to that of an operational Service aircraft. For example, the loss of speed due to camouflage paint may exceed 30 m.p.h. for a 400 m.p.h. aircraft, while bad production manufacture may reduce the speed by as much as 10 per cent., and drastically impair the handling qualities as compared with a well-made specimen.

These points and others apply to all aircraft, and practically no data on their effects in each particular case have been published. Since most published performance figures refer to aircraft under unspecified conditions, no accurate comparisons would appear possible.

One is forced to the conclusion that these lists merely demonstrate the personal prejudice and national outlook of the writers.

W. C. J. GARRARD, B.Sc., Ph.D.
E. J. ARCHBOLD, B.Sc.

[The writers of above letter have "taken the words out of our mouth." It is obviously possible to vary such lists *ad infinitum*. Many more letters have reached us, but correspondence on this subject must now cease.—ED.]

AIRPORT POLICY

Designs Should Allow for Development

IN the note "West of Scotland Airport Policy" in your issue of April 15th there is a paragraph which runs: ". . . and it is believed that the ultimate aim would be to secure the national ownership of airfields for international and interior traffic," and "Developments in the past have been hindered by competing local authorities anxious to have airports within their territories."

May I say that in my opinion the above lines could represent the basis of a technical treatise and the references of a Government commission. Of all the services connected with civil aviation, airport development seems to have been regarded previously as the ugliest duckling ever.

Pick up any annual report on civil aviation and you will read that "improvements were made here . . . within the limitations imposed by the airport's traffic," and "a number of tall trees were removed from there," and "night lighting, etc., etc., was installed," and so on. Most of this, incidentally, being due to the recommendations of the Maybury Committee.

It is true, of course, that we cannot hope to design and plan an airport now which will be modern and efficient in 50 years' time, but we *can* arrange it so that such modifications as will be necessary can be made with greater ease.

I should think, personally, that ground services mirror the condition of an air line more clearly than anything else. In other words, a first-class civil air transport service cannot be succoured on a third-class ground organisation. As yet, as far as I can see, nobody seems to care very much about our national airports, with the result that they are just an heterogenous conglomeration of polyglot ideas. (I have even heard it put forward quite seriously that airport buildings should be so built that local spectators when watching aircraft should not be dazzled by the afternoon sun!)

I hope our post-war civil airports will be designed, planned and conceived with the same brilliance as our war aircraft.

H. I. GAYTHORNE HARDY.

NOW READY

AIRCRAFT IDENTIFICATION

A reprint of a highly effective and successful series of articles from FLIGHT delineating and describing Service types and their characteristics

3/6 (or 3/9 post free)

Flight Publishing Co. Ltd., Dorset House, Stamford Street, London, S.E.1

Airborne Engineers of the U.S. Army backing a jeep into the nose entrance of a C.G.4 Waco glider. The pilot's controls go up the back of the cockpit and over pulleys on the nose hinge line.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm

News and Announcements

Awards

THE KING has been graciously pleased to approve the following awards, in recognition of gallantry displayed in flying operations against the enemy:—

Distinguished Service Order

Lt. D. S. ROGAN, S.A.A.F., No. 1 Sqn.—During September, October and November, 1941, Lt. Rogan completed many operational sorties and destroyed two enemy aircraft. On November 24, 1941, he participated in a low level attack on a concentration of enemy motor transport and tanks. Pressing home his attack in the face of a hail of anti-aircraft fire, Lt. Rogan was wounded in the right leg and right hand, his foot being virtually shot off. With remarkable determination and courage he succeeded in flying back to base and making such a good landing that his aircraft was serviceable again the following evening. This officer has since been fitted with an artificial foot and resumed operational duty.

Bar to Distinguished Flying Cross

Act. Sqn. Ldr. R. G. BARRELL, D.F.C., R.A.F.V.R., No. 7 Sqn.—One night in February, 1943, Sqn. Ldr. Barrell and Sgt. Hudson were captain and flight engineer of an aircraft detailed to attack Cologne. Whilst over the target area the aircraft was subjected to intense and concentrated anti-aircraft fire. Despite this, Sqn. Ldr. Barrell pressed home his attack but, after releasing his bombs, the aircraft was hit. One engine was put out of action and the elevator control cable was severed, which caused the aircraft to dive out of control. Considerable height was lost before the captain, assisted by Sgt. Hudson, skilfully regained control. Sqn. Ldr. Barrell then headed the bomber for home. Meanwhile, Sgt. Hudson gave instructions to a member of the crew as to the care of another engine which seemed likely to fail and then attempted to repair the elevator control. He succeeded in so doing by the time his captain had flown the damaged aircraft to base, where a masterly landing was effected. Both these members of aircraft crew have taken part in many sorties against heavily defended targets.

F/O. C. D. INCE, D.F.C., No. 7 Sqn.—One night in February, 1943, this officer captained an aircraft which attacked Cologne. Whilst crossing the enemy coast on the outward flight, the bomber was attacked by an enemy fighter. The port wing and tail plane were damaged, while the port petrol tanks were pierced and the petrol control cock cables were severed; the electrical system also sustained damage. Despite this, F/O. Ince pressed on to his target which he bombed successfully. Displaying great skill and determination he then flew his damaged aircraft to base where he made a safe landing.

Distinguished Flying Cross

F/O. E. L. MUSGRAVE, R.A.A.F., No. 137 Sqn.—This officer has taken part in a large number of operational missions. In attacks on the enemy's communications in Northern France and Belgium he has damaged seven locomotives. One night in February, 1943, he took-off to search for a large merchant vessel, escorted by five armed ships, reported in the Channel. Although the night was very dark, F/O. Musgrave sighted the vessels sailing close in to shore. Skilfully approaching the merchant vessel he flew in to attack but was frustrated by heavy fire from the coastal defences. Despite this, F/O. Musgrave persisted and, after diving through the searchlights from the shore he attacked his objective, releasing his bombs from a low level. Although his aircraft was damaged by opposing fire from the ships, he flew it safely to base.

P/O. H. B. NEWTON, R.N.Z.A.F., No. 125 Sqn.—This officer formerly served in Bomber Command, where he successfully completed nine operational sorties over enemy territory, and latterly has completed much operational flying while serving in Fighter Command. One night in February, 1943, he destroyed at least two Do 217s.

Sqn. Ldr. D. G. WARREN, No. 162 Sqn.—On one occasion, owing to his brilliant airmanship, this officer flew a Wellington aircraft 400 miles on one engine to within two miles of base. At that point the second engine ceased, and he force-landed successfully in the dark. On another occasion Sqn. Ldr. Warren showed great determination when searching for three aircraft known to have force-landed in the desert.

Act. Sqn. Ldr. M. POWELL, R.A.A.F., No. 40 Sqn.—Sqn. Ldr. Powell is a flight commander who has taken part in a large number of operational sorties. One night in December, 1942, he was detailed to attack the docks and shipping at Tunis. Despite poor visibility and bad weather, bombs were seen to burst on the main quay and on ships alongside the quay. At least one ship appeared to disintegrate.

Flt. Lt. W. S. AUSTIN, R.N.Z.A.F., No. 30 Sqn.—Since November, 1940, Flt. Lt. Austin has completed a large number of operational missions, including twenty-eight sorties against targets in Germany and occupied Europe. At the end of his first tour of duty he volunteered to remain as Squadron Navigation Officer during his rest period, and later accompanied a detachment overseas and took part in operational duties. Since then Flt. Lt. Austin has operated continuously in India and the Middle East.

Flt. Lt. D. W. BARLOW, No. 208 Sqn.—Flt. Lt. Barlow has completed a large number of operational sorties, flying alone on many occasions. He has shown marked determination and skill in obtaining information, and has been intercepted by enemy fighters upon a number of occasions, but has always returned to base safely. During the recent advance of the Eighth Army he made a particularly brilliant low level reconnaissance, searching for enemy tanks in the battle area, and his report earned the special commendation of the Army Commander.

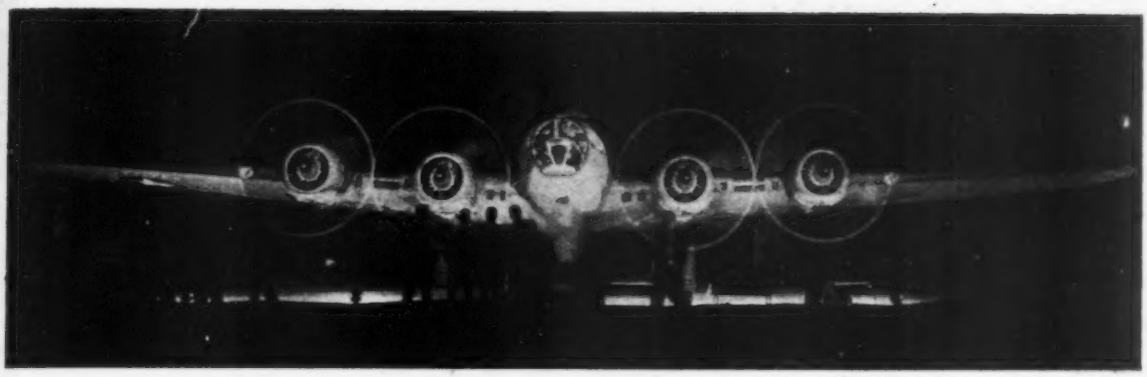
Flt. Lt. A. K. MALEY, R.A.F.V.R., No. 162 Sqn.—This officer has completed a number of operations and achieved valuable results. Frequently these flights have been of an extremely dangerous character over heavily defended areas.

Flt. Lt. A. R. F. THOMPSON, R.A.F.V.R., No. 73 Sqn.—Since September, 1942, Flt. Lt. Thompson has participated in many operational sorties, and for the last two months has commanded a flight. He has always shown the greatest keenness for night operations, and has many times flown through severe anti-aircraft fire to attack his targets. He has destroyed at least three enemy aircraft and damaged others. This officer has also made a number of low level attacks, during which he has inflicted considerable destruction and damage on enemy vehicles and military installations.

Capt. J. M. FAURE, S.A.A.F., No. 1 Sqn.—During the last twelve months Capt. Faure has completed many operational sorties, in the course of which he has destroyed at least five enemy aircraft and damaged several others. He has also led his squadron on many low level attacks. In one engagement in November, 1942, he destroyed and damaged a number of enemy lorries, but his aircraft was hit by anti-aircraft fire. On the return flight he was fired on by many enemy convoys, and was forced to land thirty miles behind enemy lines, being rescued later by our land forces.

Act. Flt. Lt. G. E. S. CLABBURN, R.A.A.F., No. 3 (R.A.A.F.) Sqn.—This officer's leadership and fearless devotion to duty have at all times been outstanding. He has destroyed one enemy aircraft.

Act. Flt. Lt. C. K. GOODWIN, R.A.A.F., No. 14 Sqn.—This officer has had a long and successful



Running-up the engines of a Fortress built by the Lockheed Vega concern in California. The slight overlap of the airscrew discs probably causes a certain amount of rhythmic drumming.

SERVICE AVIATION

operational career, participating, as leading bomb aimer, in raids on enemy airfields in Crete and in sorties against enemy shipping. His raids on the airfield at Heraklion were particularly valuable, causing disorganisation at a time when the Luftwaffe was concentrating on attacking a large Allied convoy bound for Malta.

Act. Flt. Lt. J. A. HEGMAN, R.N.Z.A.F., No. 162 Sqn.—Flt. Lt. Hegman has taken part in a large number of operational sorties as captain of aircraft. He has always displayed the greatest determination, perseverance and courage.

F/O. W. W. SUTTON, R.C.A.F., No. 69 Sqn.

F/O. R. E. CLINE, R.C.A.F., No. 69 Sqn.

F/O I. C. COWAN, R.C.A.F., No. 69 Sqn.

One night in December, 1942, the aircraft in which F/Os Cowan, Sutton and Cline were flying was employed in conjunction with naval forces in an operation against an enemy convoy. Great difficulty was experienced in communicating with these forces, but F/O. Cowan finally succeeded in conveying the necessary information. In this task he was ably assisted by the pilot and by the navigator. As a result, the naval forces were enabled to make contact with the convoy, which was almost totally destroyed.

F/O. I. G. M. GOULD, No. 148 Sqn.—F/O. Gould is a navigator of considerable skill, who has on several occasions been responsible for the safe return to base of his aircraft. As a bomb-aimer he has displayed outstanding ability and determination not to release his bombs until successful runs have been made.

F/O. J. E. L. GOVER, No. 148 Sqn.—This officer has participated in many operational missions since he joined the squadron in July, 1942. He has achieved considerable success, always leading his crew in a commendable manner and pressing home his attacks with the greatest determination.

Enemy Spun In

F/O. A. W. GUBB, R.C.A.F., No. 69 Sqn.—Since his arrival in Malta in September, 1942, this officer has accomplished outstanding work. On one occasion when detailed to obtain photographs of Taranto, he flew over the harbour at an extremely low altitude to ensure the success of his mission. Later when attacked by a Mc 109 he not only took successful evasive action, but, by skilful manœuvring, forced the enemy aircraft into a spin, from which the pilot could not recover. The aircraft crashed into the sea. While acting as Deputy Flight Commander, F/O. Gubb has proved an excellent leader.

F/O. P. A. HARTMAN, R.C.A.F., No. 69 Sqn.—One night in October, 1942, F/O. Hartman sighted a large enemy merchant vessel escorted by two destroyers. Despite intense anti-aircraft fire and a dense smoke screen, he made five runs over the target before he was satisfied that his torpedo could be successfully aimed. Later reports revealed that the vessel was destroyed. On many other occasions this officer has participated in shipping strikes.

F/O. M. G. MACKENZIE, R.C.A.F., No. 148 Sqn.—F/O. Mackenzie has been engaged in operational flying since June, 1942. One night in August, 1942, he was detailed to bomb an advanced enemy landing ground, and started a large fire following a violent explosion. Later in the same month, and again in September, 1942, he participated in successful double sorties against enemy transport concentrations in the battle area.

F/O. W. W. MCRAE, R.A.F.V.R., No. 148 Sqn.—In September, 1942, this officer was detailed to attack enemy transport concentrations in the battle area. He bombed the target with great success, causing two large fires, following this up with a machine-gun attack from 600 feet. In November, 1942, he took part in successful double sorties against concentrations of enemy transport.

F/O. F. G. WHELPDALE, R.A.F.V.R., No. 69 Sqn.—The majority of the operational flights completed by this officer have been over the sea, in search of enemy shipping. He has participated in numerous reconnaissances, and has also done commendable work as Flight Navigation Officer. His coolness in the air, combined with his exceptional ability and knowledge, have enabled him to locate many important convoys, and thus to contribute much to the success of later operations.

Lt. S. RABIE, S.A.A.F., No. 1 Sqn.—Lt. Rabie has been engaged on operational flying since August, 1942, and has displayed great courage and determination. He has destroyed four enemy aircraft. During one of his first sorties his section was attacked by superior numbers of enemy aircraft. In the ensuing engagement Lt. Rabie destroyed a Macchi 202, continuing to fight with grim determination until his aircraft was ablaze and he was forced to leave it by parachute.

P/O. R. H. BAYLY, R.A.A.F., No. 3 (R.A.A.F.) Sqn.—Throughout his tour of operational duty P/O. Bayly has shown outstanding keenness and skill, both as a fighter and fighter-bomber pilot. He has destroyed one enemy aircraft.

P/O. T. L. MURRAY-PRIOR, R.A.A.F., No. 60 Sqn.—P/O. Murray-Prior has taken part in many operational missions, the majority of which have been long-distance flights over enemy territory, many under difficult and dangerous conditions.

F/O. J. A. REYNOLDS, R.C.A.F., No. 69 Sqn.—While operating from Malta, P/O. Reynolds has displayed outstanding ability in searches for enemy shipping proceeding to North African ports. In January, 1943, his aircraft was damaged by anti-aircraft fire from an enemy destroyer. Though one of the crew was injured and the hydraulic gear put out of action, P/O. Reynolds successfully flew the aircraft to base, where he made a skilful crash landing without using the flarepath. His ability and resource in completing the landing without obstructing the flarepath enabled operations to continue uninterrupted.

Flt. Lt. W. H. JONES, R.A.F.V.R., No. 7 Sqn.—In February, 1943, this officer was the navigator of the leading aircraft of a bomber force detailed to attack Bremen. Whilst over the city, just as the bombs were released, his aircraft was subjected to heavy and concentrated fire from the ground defences. Flt. Lt. Jones was wounded in the cheek, but, although in obvious pain, continued his navigational duties, setting courses for the homeward flight. By the time the coast was reached, Flt. Lt. Jones had lost much blood, but he refused to leave his post until the aircraft was landed at base. This officer has participated in 41 sorties.

P/O. E. T. WARE, R.A.F.V.R., No. 35 Sqn.—One night in February, 1943, this officer captained an aircraft detailed to attack Lorient. During the outward flight, whilst crossing the French coast, one of the starboard engines failed. Despite this, P/O. Ware continued his mission. When nearing the target area one of the port engines showed signs of overheating, but he flew on to the target and bombed it. Afterwards, P/O. Ware flew the bomber back to base on three engines, having skilfully controlled the overheated engine.

Jungle Sorties

F/O. A. P. MILLAR, R.A.F.V.R., No. 20 Sqn.—This officer has undertaken 31 operational missions, including many reconnaissances over the enemy's forward positions. These were invariably over dense jungle country, and, to obtain information, F/O. Millar had to fly at tree-top height, thus being exposed to enemy small arms fire at short range. In addition, he has completed a number of general photographic reconnaissances which involved flying for long periods over the enemy's positions.

F/O. A. R. HAINES, R.C.A.F., No. 102 Sqn.—In December, 1942, this officer was the navigator of an aircraft which attacked a target in the Ruhr. In hazardous circumstances he displayed courage, fortitude and resource of a high order.

F/O. J. A. MCCAIRNS, M.M., R.A.F.V.R., No. 161 Sqn.—This officer has completed many sorties, most of them of a hazardous nature. He is a courageous and determined pilot, who has set an example worthy of the highest praise.

F/O. P. E. VAUGHAN-FOWLER, No. 161 Sqn.—In the course of a number of hazardous operations F/O. Vaughan-Fowler has displayed unsurpassed skill, great courage and outstanding devotion to duty.

W/O. H. C. HERBERT, R.A.A.F., No. 105 Sqn.—One afternoon in March, 1943, these airmen were pilot and navigator respectively of an aircraft detailed to attack railway communications in North-West Germany. Sgt. Jacques skilfully navigated the aircraft to the selected stretch of track where, almost immediately, W/O. Herbert was enabled to attack a moving train, inflicting damage. A mile further ahead, he attacked another locomotive, causing disruption. A little later, yet a third train was bombed, the rear part being completely wrecked; some of the trucks were hurled down the railway embankment by the force of the explosion. Although the bomber was damaged by anti-aircraft fire, W/O. Herbert flew it back to base.

Distinguished Flying Medal

Sgt. H. J. HUDSON, No. 7 Sqn.—For citation see Act. Sqn. Ldr. Barrell, D.F.C.

Sgt. G. W. JACQUES, No. 105 Sqn.—For citation see W/O. HERBERT.

Flt. Sgt. H. G. ARNOLD, No. 162 Sqn.—Throughout his operational career, this airman has accomplished all his allotted tasks steadily and successfully. Twenty-three of his operational sorties were completed from England and the remainder from the Middle East.

Flt. Sgt. P. W. CARRUTHERS, No. 225 Sqn. (Prisoner of war.)—The majority of the sorties in which this airman has participated have been unescorted raids on such targets as Benghazi harbour and later on enemy ground troops. During these operations his flying was of an extremely high quality. His efficiency on the ground was only surpassed by his outstanding keenness to engage the enemy in the air. On one occasion after a successful night raid, he arrived at base to find the landing ground completely obscured by mist. In spite of this, he made a perfect landing through a break in the clouds. Later in the campaign Flt. Sgt. Carruther's aircraft was attacked and severely damaged by three enemy fighters. By means of skilful evasive action and superb airmanship he was able to make a successful crash landing, though two members of his crew were wounded.

Flt. Sgt. K. CLARKE, No. 148 Sqn.—Flt. Sgt. Clarke has taken part in many operational sorties, mostly as captain of aircraft. One day in September, 1942, he made three attacks on the defences at Tobruk and caused a large fire. On two other occasions he has made double sorties on enemy motor transport, each time pressing home his attacks with determination and achieving great success.

Flt. Sgt. J. MARTIN, No. 160 Sqn.—Flt. Sgt. Martin is at present serving on his third tour of operational flying. Flt. Sgt. Martin has destroyed two enemy aircraft and probably destroyed others.

Sgt. G. R. P. CHAUNDY, No. 148 Sqn.—This airman has captained an aircraft crew during his last 33 sorties and has invariably pressed home his attacks with determination and skill in adverse circumstances and in the face of severe enemy opposition. In November, 1942, he participated in a double sortie against enemy transport concentrations in the battle area. During the second flight he made five runs over the target causing an immense explosion followed by large fires. On several other occasions Sgt. Chaundy has been successful in bombing operations against motor transport.

Sgt. G. COLEMAN, No. 148 Sqn.—Since July, 1942, this airman has shown great perseverance and determination in attacking enemy targets. In November, 1942, he was detailed to attack the road between Tobruk and Tmimi and persisted in his task although the starboard engine in his aircraft failed over the target area. On the return journey, as the bomber could no longer maintain height, Sgt. Coleman crash landed the aircraft with such skill that no member of the crew was injured.

Sgt. F. J. FRASER, No. 148 Sqn.—This airman has invariably set a fine example to his crew in pressing home his attacks on the enemy despite opposition. In August, 1942, he was detailed for a double sortie against enemy motor transport concentrations in the battle area. Both attacks

SERVICE AVIATION

were completed from low altitudes, causing much damage and starting two fires. Later in October, 1942, in spite of adverse weather, Sgt. Fraser made a further attack on concentrations of enemy aircraft. Opposition was strong, but this airman made three runs over the target and started three fires which afterwards joined to form a large conflagration.

Sgt. C.-J. SCHULMAN, No. 60 Sqn.—Sgt. Schulman has participated in a large number of operational sorties. On two occasions he has been compelled to fly his aircraft back to base on only one engine. On another occasion when being attacked by enemy aircraft, owing to his exceptional ability as a pilot, he was able to evade the attackers and complete his mission. On several other occasions this airman has completed two sorties in one day.

Sgt. J. M. SCOTT, R.A.A.F., No. 148 Sqn.—Although Sgt. Scott has been involved in three flying accidents, he has continued to perform his duties most efficiently, thereby setting a fine example to all members of air crew in the Squadron.

Sgt. G. SOUTER, No. 69 Sqn.—Sgt. Souter is employed as wireless operator/air gunner in his flight commander's aircraft and has on several occasions overcome great difficulties whilst transmitting important messages to base. His coolness when attacked by the enemy has been responsible for the extrication of his aircraft from many hazardous situations. On one occasion his expertness in aircraft recognition enabled his pilot to avoid attack by enemy fighters.

Sgt. P. R. STREET, No. 148 Sqn.—During his tour of operational duties, this pilot has displayed outstanding skill and determination. In November, 1942, while attacking enemy motor transport, difficulties were experienced with one engine in his aircraft. Through skilful pilotage Sgt. Street flew the bomber back to base and made a safe landing. On another occasion, he proceeded on a bombing raid although his port tyre had burst on taking off, and made a successful landing on his return without further damage to the aircraft.

Sgt. R. D. MILNER, No. 226 Sqn.—In January, 1943, this airman was the air gunner of one of a formation of Boston aircraft detailed to attack a target at Flushing. During the operation heavy anti-aircraft fire and much fighter opposition were encountered. Observing a Me 109 flying in to attack from the rear and below the formation, Sgt. Milner coolly withheld his fire until the attacker came within closer range. Then with a well-directed burst, he shot it down in flames. Four days later this airman took part in a bombing attack on the viaduct at Morlaix. On the return flight, near the French coast, the formation was attacked by a number of enemy fighters. During the engagement Sgt. Milner displayed great skill and determination, and played a large part in frustrating the enemy's attacks.

Flt. Sgt. K. SMITH, R.N.Z.A.F., No. 149 Sqn.—Flt. Sgt. Smith, who has completed 23 operational missions, has invariably displayed outstanding determination to make every sortie a success. One night in January, 1943, he captained an aircraft detailed to attack Lorient. Shortly after taking-off, one compass and the starboard inner propeller exactor control became unservicable, while some time later, when crossing the Channel, the blind flying instruments, with the exception of the turn and bank indicator, became useless. Heavy cloud prevailed along this route, necessitating much blind flying, but, in spite of his difficulties, Flt. Sgt. Smith reached his target, bombed it and safely accomplished the return flight. On another sortie, with a target in Germany as the objective, his aircraft was attacked by an enemy fighter on the outward flight. Two engines of the bomber were put out of action, and the aircraft went out of control. Flt. Sgt. Smith regained control and, shortly afterwards, succeeded in re-starting one of the damaged engines. He skilfully flew the damaged bomber back to this country, landing at the first available airfield.

Stuck Bomb

Flt. Sgt. D. E. WHITE, R.A.A.F., and Sgt. F. H. WARD, R.A.A.F., both of No. 406 (R.A.A.F.) Sqn.—These airmen were pilot and bomb aimer respectively of an aircraft detailed to attack St. Nzzaire one night in March, 1943. Shortly after crossing the French coast, on the outward flight, a Ju 88 was encountered. In the ensuing combat, the bomber was damaged and temporarily went out of control, diving steeply. By a strenuous effort, Flt. Sgt. White pulled out of the dive at 4,000 ft. and, although the aircraft was difficult to control, continued to the target and bombed it. At the completion of the bombing run, whilst taking a photograph, Sgt. Ward discovered that one of the bombs had failed to release and could not be jettisoned. Sgt. Ward endeavoured to dislodge the bomb and, after half an hour of unrelaxed effort, succeeded in so doing. Afterwards, he went to the assistance of his pilot, who was having great difficulty in controlling the damaged bomber. Displaying fine airmanship, Flt. Sgt. White succeeded in flying it back to this country, where he effected a safe landing in difficult circumstances.

Sgt. A. J. W. R. COUPAR and Flt. Sgt. R. B. CHARTERS, R.C.A.F., both of No. 199 Sqn.—One night in March, 1943, these airmen were captain and navigator respectively of an aircraft detailed to attack Essen. On the outward flight, one engine of the bomber became overheated, but Sgt. Coupar flew on to the target and bombed it. Shortly after crossing the Dutch coast, on the return journey, the aircraft was attacked by an enemy fighter, sustaining much damage. The wireless apparatus was rendered usserviceable, the inter-communication and hydraulic systems were put out of action, causing the bomb doors to open and the undercarriage to hang in the down position. In spite of this, Sgt. Coupar coolly and skilfully evaded the attacker and set course for base. During the remainder of the homeward flight, Flt. Sgt. Charters, who had been wounded in the chest, displayed great fortitude, remaining at his post to continue his navigational duties. Sgt. Coupar eventually flew the damaged bomber to an airfield, where he effected a successful crash-landing.

George Medal

P/O. A. G. G. RICHMOND, R.A.A.F., No. 230 Sqn.—P/O. Richmond was a member of the crew of a Sunderland aircraft which crashed into the sea in September 1942. He observed another member of the crew (the wireless operator/air gunner), who was surrounded by a pool of burning petrol and unable to swim owing to a broken leg. Although suffering from lacerations of the scalp, right arm, left leg and left knee, P/O. Richmond dived under the flames, pulling his comrade to safety, and eventually succeeded in getting him on to a semi-inflated dinghy. He then supervised the rescue of three more of his companions, and it was not until it became certain that no other survivors were in the vicinity that he abandoned the search and boarded a rescue boat. P/O. Richmond displayed a very high standard of courage and devotion to duty and undoubtedly saved the wireless operator's life.

Sgt. D. B. GODFREY.—One night in December, 1942, Sgt. Godfrey was the rear gunner of a Wellington aircraft which crashed into some trees during a rain storm and bad visibility. The aircraft burst into flames instantly. After Sgt. Godfrey had extricated himself from his turret and fought his way clear of the wreckage, he observed the wireless operator, who was severely injured, lying near the fire. He dragged him clear of the burning wreckage, and, having also assisted the pupil pilot to safety, Sgt. Godfrey realised that the pilot instructor was trapped in the blazing cockpit. He immediately dashed back into the fire in an endeavour to extricate the instructor. A petrol tank exploded, and heavy pieces of the wreckage were hurled into the air, but this did not deter Sgt. Godfrey, and, in spite of the heat and flames, he backed and pulled at the wreckage until finally he succeeded in releasing the instructor. He was pulling him clear when assistance arrived. Sgt. Godfrey sustained severe burns, causing temporary blindness.

Air Force Medal

Sgt. J. D. MUIR.—One night in December, 1942, Sgt. Muir was the pilot of a Wellington aircraft participating in a photo flash bombing exercise. One photo flash was released successfully, and the second was about to be released when it exploded in the flare chute and killed the wireless operator. The aircraft became uncontrollable and a fire was started. Sgt. Muir, being unable to maintain height, ordered the remaining crew to escape by parachute. This they did with the exception of the navigator, who went to the rear of the aircraft to ascertain the precise condition of the wireless operator. After reporting to Sgt. Muir that he could not detect any pulse, the navigator then left the aircraft. Sgt. Muir knew that a crash was inevitable, but realising that the bomber was in the vicinity of two villages, and being uncertain whether the wireless operator was alive or dead, he decided to remain in the aircraft in an endeavour to land clear of the villages. He succeeded in landing the bomber in a field. Sgt. Muir extricated himself just before the aircraft became enveloped in flames, but he was unable to release the wireless operator.

B.E.M. (Mil.)

Sgt. R. A. SYMES and Sgt. A. W. NICHOLS, both of R.C.A.F., No. 405 (R.C.A.F.) Sqn.—One night in November, 1942, Sgts. Symes and Nichols were the pilot and engineer respectively of an aircraft engaged on anti-submarine patrol duties. On the return journey engine trouble developed, and Sgt. Symes was compelled to make an emergency landing. In so doing the aircraft struck a hut and burst into flames. All the crew, with the exception of the wireles operator, who was trapped by the legs, managed to extricate themselves. Knowing that the petrol tanks might explode at any moment, Sgt. Symes and Nichols re-entered the blazing aircraft and succeeded in extricating the wireless operator; a few seconds later the petrol tanks exploded. The courage and devotion to duty displayed by these sergeants undoubtedly saved their comrade's life.

Awards of Foreign Decorations

Royal Air Force

THE KING has granted unrestricted permission for the wearing of the undermentioned decorations, conferred on the personnel indicated, in recognition of valuable services rendered in connection with the WAR:—

Conferred by His Majesty the King of the Hellenes

Royal Order of George I (with Swords)

Commander

Air Comdre. J. W. B. GRIGSON, D.S.O., D.F.C.
Act. Air Comdre. C. R. STEELE, D.F.C.

Officer

Act. Group Capt. R. T. B. HOUGHTON, A.F.C.

Royal Order of the Phœnix (with Swords)

Grand Commander

Air Vice-Marshal C. W. MEREDITH, C.B.E., A.F.C., R.A.F.V.R.

Air Force Cross (Greek)

Wing Cdr. N. DE W. BOULT, A.F.C.
Wing Cdr. N. C. HENDRIKZ.
Act. Wing Cdr. J. A. GREENSHIELDS, A.F.C., R.A.F.V.R.
Act. Wing Cdr. Lord M. A. DOUGLAS-HAMILTON, O.B.E., R.A.F.O.
Act. Flt. Lt. T. MAGNER, R.A.F.V.R.

Conferred by the President of the United States of America

Distinguished Flying Cross (American)

Act. Wing Cdr. R. M. B. DUKE-WOOLLEY, D.S.O., D.F.C.

Conferred by His Majesty the King of Norway

War Medal

Wing Cdr. H. B. JOHNSON, D.F.C.

The Motor Industries Spitfire squadron at its airfield in North Africa. The runways are apparently a mixture of interlocking Marston strip, as used by the Americans, and our lighter and simpler wire mesh Somerfeld track.

SERVICE

Roll of Honour

Casualty Communiqué No. 224.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list 63 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. O. P. E. R. J. Adlam; Sgt. H. E. Amos; Sgt. W. Ball; Sgt. A. C. Clifford; Sgt. T. C. Coles; Sgt. F. Cooper; Act. F/O. B. Dunn; F/O. H. Farquharson-Ley; Sgt. G. V. W. Giles; Sgt. R. Gratrex; Sgt. W. J. Hart; Sgt. W. C. I. Jelley; Sgt. M. N. Reilly; Sgt. H. E. R. Saunders; P/O. J. H. Simpson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. A. McD. Anderson; Flt. Sgt. M. J. Colclough; P/O. L. A. Coventry; Act. Flt. Lt. H. F. Dukes-Smith; Sgt. I. Edwards; Flt. Sgt. R. J. Flux, D.F.M.; Flt. Sgt. A. Hussey; P/O. R. M. Owen; Sgt. H. A. Payne; Sgt. A. J. Wratton.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Act. Sqn. Ldr. G. W. Alexander; Sgt. D. Bagley; Flt. Lt. W. G. Barnes, D.F.C.; Sgt. H. J. Bennett; Sgt. H. A. Booth; Sgt. G. A. Dale; P/O C. W. Dellow; Flt. Sgt. S. E. Eades; Sgt. W. J. Edgley; Sgt. R. Gallagher; Sgt. J. G. B. Garson; Flt. Sgt. D. Gilligan; W/O. L. Harrison; Sgt. P. Harrison; Sgt. N. C. Hayes; P/O. G. J. P. Henry; Sgt. P. F. Hickley; P/O. F. W. G. Hill; Sgt. W. J. Jewell; Sgt. W. J. Laker; Sgt. D. MacDonald; Sgt. H. M. McHarg; P/O. J. E. Maple; Sgt. J. McP. Milligan; Act. W/O. T. J. Mycock, D.F.C.; Sgt. E. W. Perry; Act. Flt. Lt. M. R. M. Pooles; Sgt. D. E. Rarity; Sgt. L. Shearer; Flt. Sgt. W. Shelley; Sgt. J. Tait; Sgt. R. C. Wentworth-Hyde; Sgt. A. Wilstrop; Flt. Sgt. L. Wiltshire; Sgt. R. Woollard.

WOUNDED OR INJURED IN ACTION.—Act. Flt. Lt. K. G. Flintoft; Sgt. K. F. J. Longley; P/O. R. H. McGregor.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. I. W. Arnold; Sqn. Ldr. P. M. V. Lysaght; F/O. J. H. C. McIlwrick; Act. Flt. Lt. M. F. Taylor.

MISSING.—Sgt. J. F Arrowsmith; Sgt. H. N. Balmforth; Sgt. H. E. Bradshaw; Flt. Sgt. F. A. Budden; Sgt. R. E. Burt; P/O. C. S. Challoner; P/O. C. E. Chapman; Sgt. F. M. Christmas; Flt. Sgt. D. I. Clunes; F/O. D. N. Cochrane; Flt. Sgt. J. R. Couper; Sgt. K. O. Court; Flt. Sgt. G. A. Croall; Act. Flt. Lt. R. A. Curle; Sgt. G. W. Dempster; Sgt. D. P. Doak; P/O. L. J. Dowdall; Flt. Sgt. F. R. Duxbury; Sgt. A. W. Gardner; Sgt. M. G. Gibbons; Sgt. D. L. Gooch; Sgt. H. Green; F/O. G. B. D. Greenwood; Sgt. G. H. Hale; Sgt. D. A. Hart; P/O. W. Henry; Sgt. F. Hughes; Flt. Lt. G. R. Humphries; Sgt. J. W. Hunt; Sgt. V. E. Jack; Sgt. F. C. Kelly; F/O. C. D. Kenwick-Cox; Sgt. L. J. King; Sgt. L. J. Langham; P/O. A. F. Lear; Sgt. J. Lee; P/O. W. G. Lee; Sgt. K. R. Lees; L.A/C. L. V. McArdle; Sgt. D. McCardle; Flt. Sgt. H. B. McCreery; Sgt. M. D. McHale; Sgt. T. E. MacKrill; Sgt. J. T. McRae; Sgt. R. C. Marston; Sgt. F. Morris; Sgt. W. S. Murray; Flt. Sgt. J. Parker; L.A/C. A. Richardson; Sgt. D. S. Richings; Sgt. H. Rigby; Sgt. T. E. Russell; Sgt. A. G. Sawyer; Sgt. F. J. Skeeles; Wing Cdr. C. G. Skinner; Flt. Lt. P. C. F. Stevenson, D.F.C.; Act. Flt. Lt. G. N. Thompson; Sgt. K. D. Tookey; Sgt. B. T. White; Sgt. D. J. Williams; Sgt. J. L. Wilson; F/O. R. J. F. Windsor; Flt. Sgt. J. D. A. Wright.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—L.A/C. O R. Jolly; L.A/C. H. R. J. Partoon.

KILLED ON ACTIVE SERVICE.—Sgt. D. Black; L.A/C. J. T. Bowler; Sgt. H. Crebbin; Sgt. D. C. Fisher; F/O. J. Fisher; Sgt. T. F. J. Glover; L.A/C. R. Hamilton; Sgt. S. E. Harms; Sgt. G. A. Hovell; Sgt. G. O. John; F/O. M. A. Khan; Sgt. B. C. Lock; Sgt. K. H. Long; Sgt. R. A. Machin; A/C.1 F. Milam; Sgt. R. H. Millar; Sgt. B. F. Mullett; Sgt. T. Narishkin; Sgt. P. G. Nockles; Sgt. J. E. Price; P/O. W. T. Richardson; Sgt. S. Sore; Sgt. A. W. Stephenson; Sgt. H. Terry; Sgt. H. K. M. Thomson; Sgt. H. V. Whiteside; P/O. A. V. S. Wilson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. A. J. Abrahams; Sgt. V. W. G. Dickins; Sgt. R. Dunne; P/O. G. W. M. Francis; Sgt. J. E. H. Gregory; Sgt. F. McDougall; Sgt. G. K. McMillan.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Cpl. L. R. Hunt; Flt. Sgt. P. A. T. Read; Cpl. W. E. Toon.

DIED ON ACTIVE SERVICE.—L.A/C. J. W. Barker; Sgt. D. O. Bowie; W/O. L. Brymer; A/C.2 O. F. Commins; L.A/C. R. T. Graham; A/C.2 W. J. Griffiths; Flt. Lt. W. C. Hunter; L.A/C. J. Kerr; L.A/C. G. Longden; A/C.1 H. J. Mann; Cpl. L. J. M. March; A/C.1 C. Martin; A/C.2 G. A. Penfold; Flt. Lt. D. L. Rawnsley; A/C.1 C. McK. Reid; Cpl. J. Simpson; A/C.1 J. C. Williams.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. H. J. E. Burrell; F/O. P. N. Kenny; Sgt. J. W. McLarnon.

Air Marshal R. M. Drummond, C.B., D.S.O., O.B.E., M.C., who is to be the new Air Member for Training. He is at present Deputy A.O.C.-in-C. R.A.F., Middle East.

Women's Auxiliary Air Force

KILLED ON ACTIVE SERVICE.—A/CW.2 P. Baxter; Act. S/O. J. P. Chandler; A/CW.2 I. D. Collett.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/CW.2 E. E. Cockerton; L.A/CW. V. Hopkins.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. W. A. Allsopp; Sgt. D. R. Beinke; Sgt. A. S. Bennett; Sgt. T. M. Duffy; Sgt. T. L. Watkins.

MISSING.—P/O. E. C. Crapp; F/O. G. F. Davey; Sgt. A. A. Dey; Sgt. G. W. Durdin; P/O. J. G. Johnson; Act. Flt. Lt. R. S. O. Marshall, D.F.C.; P/O. D. H. Paterson; P/O. H. Riding; Sgt H. Wrench.

KILLED ON ACTIVE SERVICE.—Sgt. H. H. Lloyd.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Lt. C. H. Spurgeon.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. R. V. McLean; Sgt. F. J. O'Donohoe; Sgt. B. F. J. Parker; Sgt. E. H. Sellar; F/O. C. J. Shagena; Sgt. B. W. Turner.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. H. McAlpine.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. L. L. Aikenhead; P/O. H. E. V. Bruce; P/O. J. F. Day; Flt. Sgt. J. G. Donoghue; Flt. Sgt. C. E. Evans; P/O. P. C. Little; Sgt. D. McR. Ross.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. R. E. Noble; Sgt. J. E. S. Sasseville.

MISSING.—Sgt. R. M. Agnew; Sgt. J. J. C. Arpin; P/O. D. E. Bennett; Flt. Sgt. D. G. Culver; Flt. Lt. D. J. Curtin, D.F.C.; Sgt. W. J. R. Davies; P/O. R. Graham; Flt. Sgt. V. C. Hayward; Flt. Sgt. J. T. Hunt; Sgt. C. E. Jamieson; Sgt. H. T. A. Lawson; Flt. Sgt. D. M. Logan; P/O. J. K. MacDonald; Sgt. C. A. McArdle; Sgt. N. F. Paterson; P/O. W. N. Pleasance; P/O. C. R. Trask; Sgt. A. C. Turner; Sgt. G. Walen; Flt. Sgt. J. V. Willbee; Sgt. R. E. Williams.

KILLED ON ACTIVE SERVICE.—Sgt. J. W. Callinan.

Royal New Zealand Air Force

KILLED IN ACTION.—Sgt. A. W. Washbourne.

MISSING.—Sgt. I. H. W. Baulf; Act. Flt. Lt. J. W. Coates; F/O. I. A. C. Grant; Act. Flt. Lt. L. McLachlan; Flt. Sgt. N. H. Maul.

KILLED ON ACTIVE SERVICE.—Sgt. L. N. Abercrombie.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. D. M. Croy.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. R. D. Porteous.

South African Air Force

WOUNDED OR INJURED IN ACTION.—Lt. I. F. Kethro.

Casualty Communiqué No. 225

OF the names in this list 82 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—P/O. P. L. Clayton; P/O. L. H. Geach; Sgt. T. A. George; Sgt. J. F. Gwyther; P/O. D. M. P. Jones; Sgt. M. J. Kelleher; Sgt. K. E. W. Matthews; Sgt. J. H. Mount; Sgt. E. S. Smithson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. H. E. W. Ansell; Flt. Sgt. J. S. Clapham; P/O. P. N. Floyd; Flt. Sgt. T. A. G. Morris; F/O. R. D. Pegram; P/O. D. Percival; Sgt. M. Prescott; Flt. Sgt. T. Rankin; Flt. Sgt. G. Richard; Sgt C. Roberts; Sgt. J. Simpson; Sgt. J. Smith; Flt. Sgt. J. R. Wanbon, D.F.M.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. M. Addess; Sgt. G. Baker; Sgt. N. G. Ballingall; Sgt. C. A. Belt; Sgt. J. D. Burnley; Sgt. A. C. F. Digby; Sgt. E. Doherty; Sgt. J. A. Edwards; Sgt. G. Fobister; Sgt. A. L. Fone; Sgt. P. A. Foster; Sgt. A. R. Freeman; Sgt. J. S. Grieve; Sgt. A. J. Higgins; Sgt. J. E. Hughes; Flt. Sgt. H. F. Jordon; Sgt. A. S. Lush; F/O. F. I. Malcolm; Sgt. G. S. Markland; Sgt. G. D. Randall; Act. Wing Cdr. M. L. Robinson, D.S.O., D.F.C.; Flt. Sgt. C. M. T. Rogers; Sgt. I. J. Rollinson; Sgt. A. D. Saint; Sgt. S. E. Saunders; Sgt. A. E. Simmans; Sgt. N. W. Smith; Sgt. W. G. Smith; Sgt. J. H. Spinks; Sgt. E. G. A. Stevens; Flt. Lt. C. S. Thomas; Sgt. T. G. P. Townsend; Sgt. V. H. Twining; W/O. W. Wall; Sgt. D. J. W. Watson; Sgt. R. C. E. Willingham; P/O. R. L. Wootley.

WOUNDED OR INJURED IN ACTION.—Sgt. E. J. Robinson; Flt. Lt. J. V. Verran, D.F.C.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Lt. R. S. Miller; P/O. R. Williamson.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. R. R. Jackson.

MISSING.—Sgt. F. J. Armstrong; Sgt. R. Atkinson; Act. Sqn. Ldr. R. B. Bagguley; Sgt. W. H. Beaver; Sgt. R. F. Bell; Sgt. E. T. Beney; Sgt. R. T. Bozier; Sgt. I. J. D. Brodie; F/O. E. H. Cave-Browne; Sgt. J. T. Charlton; Flt. Sgt. F. W. R. Cole; Sgt. G. H. G. Collins; Sgt. R. A. Collins; Sgt. H. C. Cope; Act. Sqn. Ldr. G. Crichton-Miller; Flt. Lt. M. E. J. Croker; Sgt. A. D. Dinnis; Flt. Sgt. R. E. Dorman; Sgt. J. P. Duffy; Sgt. H. W. Edwards; Sgt. A. J. Feenan; Sgt. H. Fell; F/O. W. A. Fowlie; Sgt. J. M. Freshwater; Sgt. J. W. Grant; Sgt. A. R. Harding; Flt. Sgt. H. Harwood; Flt. Lt. C. K. Hayden; F/O. M. C. Hayes; F/O. R. A. Heywood; F/O. C. G. Hitt; Flt. Sgt. T. W. Holland; P/O. A. L. Holmes; Sgt. A. E. Howlett; Flt. Sgt. W. P. Hudson; Sgt. W. Hughes; Sgt. W. T. Hurl; Sgt. G. A. Lloyd; Sgt. L. S. Lovatt; Sgt. P. McAleese; Sgt. A. R. Mansford; Sgt. W. Mather; Sgt. D. H. McIville; Sgt. A. McK. Mollison; Sgt. R. P. Moodey; Flt. Sgt. F. R. Oldrieve; Sgt. J. L. Organ; Sgt. J. G. Ramshaw; P/O. G. A. Ratcliffe; Act. Flt. Lt. C. L. Selman, D.F.C.; Sgt. S. Scott; Sgt. F. R. Slocombe; Sgt. F. T. Spivey; F/O. L. W. Sprackling; Sgt. L. M. Stone; Sgt. A. B. Tarrant; Sgt. T. Teviotdale; Sgt. T. E. Thompson; Sgt. G. Tombe; Sgt. O. J. Trainor; Act. Flt. Lt. J. P. Trench, D.S.O.; Sgt. J. Turner; P/O. J. E. Ulrich; F/O. D. H. Upsher; Sgt. W. E. Waddington; W/O. F. Westcott.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—L.A/C. D. E. Hill; L.A/C. A. L. Nutter; Flt. Sgt. G. Wylie.

KILLED ON ACTIVE SERVICE.—Sgt. N. Booth; L.A/C. J. D. Burrell; Sgt. D. J. Goodchild; Sgt. J. P. Langlands; L.A/C. T. P. O'Byrne; Sgt. W. H. Owens; Sgt. W. A. Winthrop.

PREVIOUSLY MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. R. Burges; Sgt. R. C. Hutton; P/O. F. W. Roe; Sgt. W. A. Smith; Sgt. J. H. Taylor; Flt. Sgt. W. N. Ward.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. A. L. Chisholme; P/O. R. L. Martin; L.A/C. Z. Nadler.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. J. Ashton.

DIED ON ACTIVE SERVICE.—A/C.2 S. Black; A/C.1 T. Bolton; L.A/C T. W. Clancy; L.A/C. J. T. Costello; L.A/C. W. J. Davies; A/C.2 S. E. S. Fielden; A/C.2 G. G. Good; L.A/C. H. J. Hannan; Cpl. H. Hanson; Cpl. W. J. Hocking; Sqn. Ldr. L. C. Hooke; A/C.1 R. A. Hunt; A/C.1 A. J. James; A/C.2 H. Larman; A/C.1 R. A. Macdonald; Wing Cdr. R. M. C. MacFarlane, M.C.; L.A/C. E. Mallett; L.A/C. G. M. More; Sgt. L. G. Moseley; Sgt. G. B. Noble; Act. Cpl. T. S. Ogston; A/C.1 R. D. Privett; Flt. Lt. V. Hy Quinn; Cpl. P. W. Saunders; L.A/C. A. E. Shires; A/C.1 D. Smollan; A/C.2 W. C. Springer; Sgt. J. T. Tremain; A/C.2 N. Ward; L.A/C. L. C. White; A/C.2 E. W. Wilkinson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. W. Maskell; Sgt. J. Vincent; Sgt. R. A. Whitefield.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. M. E. Lovering; L.A/CW. E. C. Rose; A/CW.2 M. H. Weight.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. H. R. Fraser.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. H. G. Burney; Sgt. C. S. Mac Diarmid.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. M. Anivitti; Sgt. H. R. Brodie; Sgt. L. H. James; Sgt. D. G. Kitchen; Sgt. G. L. Stevens.

WOUNDED OR INJURED IN ACTION.—P/O. F. T. Johnson.

AVIATION

SERVICE AVIATION

MISSING.—P/O. R. H. Annells; Sgt. G. Arnold; Sgt. R. A. Barton; Sgt. J. Chandler; Sgt. N. S Forrester; P/O. L. G. Gosper; Flt. Sgt. K. R. Heming; Sgt. A. E. Hiley; Sgt. F. H. Paterson; Sgt. S. G. Quinlan; Sgt. J. H. Sullivan.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. F. H. Jones.

DIED ON ACTIVE SERVICE.—A/C.2 G. E Saunders.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. N. Grattan; Flt. Sgt. J. L. Hutchison; F/O. J. P. Ryan.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. P. C. Budd; Sgt. R. N. A. Creswell; Sgt. R. B. Goodman; P/O. A. G. Griffith; Flt. Sgt. W. F. Millerd; Flt. Sgt. R. G. Read; Flt. Sgt. A. A. Smith.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. R. B. Charters; Sgt. H. W. Davey.

MISSING, BELIEVED KILLED IN ACTION.—F/O. P. J. Leboldus.

MISSING.—Flt. Sgt. A. Arlen; P/O. J. B. Courtney; Sgt. E. F. Fournier; P/O E. J. Fry; Sgt. R. O. Fulton; Flt. Sgt. W. R. Gray; Sgt. H. T. Jacobsen; Flt. Sgt. B. A. Levasseur; Flt. Sgt. C. A. Milan; P/O. H. A. Partridge; Sgt. W. A. Robinson; Flt. Sgt. J. E. Robinson; Sgt R. B. Van Buren; Sgt. R. P. Wilson.

KILLED ON ACTIVE SERVICE.—P/O. J. D Edwards; F/O. A. A. O'Brien.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. D. R. Thomson

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. A. Baird; P/O. G. McL. Densem; Flt. Sgt. S. H. Dromgoole; P/O. W. J. Fulton; Flt. Sgt. G. H. Vogan.

MISSING.—Sgt. C. R. Davey; Flt. Sgt. A. J. Jenner; Flt. Sgt. N. A. McMillan; Flt. Sgt. K. R. Marshall.

KILLED ON ACTIVE SERVICE.—Sgt. B. W. Tully

Indian Air Force

DIED ON ACTIVE SERVICE.—A/C.2 M. Sardar.

Casualty Communiqué No. 226

OF the names in this list, 26 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. J. Callanan; Sgt R. V. Coombs; Sgt. D. Dunnett; Sgt. D. F. Gibbs; Sgt. E. Hemmings; Sgt. L. Jones; Sgt. G. W Knox; Sgt. J. Martin; Sgt. E. L. Rayner; Sgt J. B. Reay; Sgt. D. G. Walker.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. W. P. Ashun; Sgt. F. W. E. Ball; P/O. J. E. Firman; Sgt. H. Halliwell; Sgt. T. Hindle; Sgt. G. Houghton; P/O. J. G. Mac Kinnon; Sgt. J. F. McLinden; Flt. Sgt. J. Mac Queen; Sgt. K. R. Mellowes; Sgt. R. E. Parrack; Sgt. W. Thompson; Flt. Sgt. V. A. Willets.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. W. C. Evans; P/O. R. W. Franklin; Sgt. K. Hailstone; Sgt A. Smithson; Flt. Sgt. J. Thompson; P/O. S Widdup.

WOUNDED OR INJURED IN ACTION.—F/O. W. J Goby; Sgt. R. J. Potts.

MISSING, BELIEVED KILLED IN ACTION.—Sgt L. B Alsop; F/O. J. M. Bell; Sgt. A. E. Blackwell; Flt. Sgt. W. A. Brown; Sgt. W. E. Burns; Sgt. W. H. Clark; Sgt. C. T. Clifton; Act. Flt. Lt. A Cowie, D.F.M.; Sgt. W. A. Dawe; Sgt. G Emery; Flt. Sgt. F. W Hart, D.F.M.; Sgt. D Heap; Sgt. D. G. Hobbs; Sgt. R. W E. Holley; F/O. J. W. W. Holmes; Act. Sqn. Ldr. S. G Hookway, D.F.C.; Flt. Sgt. E. K. Jones; F/O E. Luff; P/O. J. McCartney; Sgt. J. H. McKenna; Sgt. P. J. Rose; Sgt. A. Sandow; P/O. F. A. M. Shooter; P/O. J. R. Thompson; F/O. F. E. Townsend; Sgt. L. Tulloch; F/O. R. D. Turk; Sgt. E. C. B. Williams; Sgt. H. Wood; Sgt. H. E Woodruff; Sgt. W. G. Yetton

MISSING.—P/O. L. A. Allan; Sgt. F. H. Allen; F/O. R. Allin; P/O. K. D. Babington-Browne; Sgt. R. D. Baker; Sgt. H. W. Baldock; Sgt. J. A. Barnard; Flt. Sgt. R. Bartolotti; Flt. Sgt. K Bolton; Sgt. J. E. Bonson; Sgt. D. S. Bratt; P/O. L. M. Bridger; F/O. J. H. Brown; Sgt. L. Burnett; Sgt. A. Campbell; Sgt. E. Carr; Sgt. R. L. Colverson; Sgt. T. E. Constable; Sgt. B. H Cruikshank; Sgt. R. V. M. Davenport; Sgt. C. Davies; Sgt. W. Day; Sgt. J. S. Dobie; Flt. Sgt M. L. Durling; Sgt. K. T. Dutton; Sgt. T. E Edwards; P/O. H. T. Etienne; Sgt. P. Evison; Sgt. D. G. Fairlie; Flt. Sgt. P. Flynn; Flt. Sgt D. Forbes; Flt. Lt. C. D. Gilliat; F/O. W. R Golding; Act. Flt. Lt. L. G. Goodley; Sgt. J. W Gould; P/O. B. J. Gunter; Sgt. W. Halliday; Sgt. W. Halsall; Sgt. K. Hands; Flt. Sgt. C. Hanstock; Sgt. K. Hitchen; Sgt. L. G. Hudson; P/O. J. B. O'C. Huggard; Flt. Sgt. J. H. Hughes; L.A/C. P. Hunt; Sgt. E. W. Inwood; Sgt. K. Jenner; P/O. B. Johnson; Flt. Sgt. J. M. C. Johnson; Sgt. P. R. Kimber; Sgt. L. A. Leadbitter; Sgt. J. Linacre; L.A/C. A. F. Mawby; P/O. D. G. Mercer, D.F.C.; Flt. Sgt. G. B. C. Miller; Flt. Sgt. G. Mitchell; Sgt. J. A. Molloy; Sgt. W. Noble; Sgt. L. C. Pearson; Flt. Sgt. G. Percy; Act. Flt. Lt. W. J. Picken, D.F.C.; Sgt. J. G. Powell; Flt. Sgt. J. H. Prior; F/O. F. Richards; Sgt. R. G. Riley; Flt. Sgt. J. V. Roper; Sgt. S. J. Rose; Sgt. G. C. D. Sayer; P/O. E. G. Shreeves; Sgt. K. R. W. Simmonds; Sgt. C. J. H. Smith; Sgt. J. Smith; Sgt. A. G. Snow; Sgt. R. Spencer; Sgt. G. B. Stewart; Sgt. N. P. Taylor; Sgt. W. Taylor; Sgt. J. M. Thom; Sgt. J. B. Thompson; Sgt. J. J. Thompson; Sgt. L. R. Thompson; Sgt. J. A. Todd; Sgt. W. H. Trotter; Sgt. G. W. Turley; Sgt. F. H. L. Vines; Sgt. E. S. Waghorn; Sgt. R. R. L. Webber; L.A/C. S. R. Williams; Sgt. J. F. L. Wilson; Sgt. E. A. Wright; Sgt. A. C. Yielder; Sgt. S. Young.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—A/C.2 J. L. Paterson.

KILLED ON ACTIVE SERVICE.—Sgt. W. V. C. Alston; Sgt. P. W. Barrett; L.A/C. S. Bennett; P/O. H. Boyer; P/O. R. Bokobza; Sgt. J. S. Campbell; Sgt. R. C. G. Cater; L.A/C. J. G. Chittock; A/C.1 C. D Cook; Sgt. L. A. Court; Sgt. R. T. Davies; P/O. R. B. Dunsmuir; Sgt. J. Douglas; A/C.1 J. Edmond; Sgt. G. J. S. Farthing; Sgt. J. Gilmore; Sgt. R. W. Gutteridge; P/O. F. Hodge; L.A/C. B Holden; A/C.2 K. R. H. Jones; Cpl. J. C. Ladd; P/O. J. R. Latour-Eppy; Sgt. P. F. McCarthy; L.A/C. N. W Mitchell; L.A/C. J. B. Mole; Sgt. K. W. Moore; P/O. J. H. G. Moriarty; Sgt. F. W. Newsome; Sgt. A. Norbury; P/O. J. A. Paterson; Sgt. P. D Rumsam; Sgt. C. W. Rusling; L.A/C. J. C. Saunders; Sgt. D. Saywell; P/O. S. M. Shute; P/O S. J. Stenning; L.A/C. D. N Thomas; A/C.2 C. E. Trapps; Sgt. J. D'A. Wall; F/O. C. S. Wallace; A/C.2 R. Ward; L.A/C. E. S. W. Watts; Sgt. A. N. E. White; F/O. H. E Wright

WOUNDED OR INJURED ON ACTIVE SERVICE.—W/O. G. T. Baxter.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—A/C.2 W Logan; Sgt J. R. Rugeroni-Hope.

DIED ON ACTIVE SERVICE.—L.A/C. D. H Blackmore; L.A/C. A. E. G Daborne; Sgt S. Green; A/C.2 S. P. G. Jones; A/C.2 G. Little; A/C.1 C. Malloch; Act. Sqn. Ldr. H. E. Ormond; Act. Flt. Lt. I. R. Purdie; A/C.1 F. J Stagg; A/C.1 T. A. V. H. Sutherland-Clift.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/C/W.2 H. A Mesure

Royal Australian Air Force

KILLED IN ACTION.—Sgt. H. D. Everingham; Sgt. H. R. Fraser; Sgt. A. L. Hewish; P/O. M. D. Shiels.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. P. P. Handfield; Sgt. E. G. Holloway; Sgt. J. M. McCullough.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. E. G. Broad.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. A. E. Pearce; Sgt. C. E. Tanner.

MISSING.—Flt. Sgt. C. C. Atkin; Flt. Sgt. H. H. Brien; Flt. Sgt. M. G. Delatorre; Act. Flt. Lt. C. A. Giles; Flt. Sgt. I. V. Heatley; Flt. Sgt. D Kerr; Flt. Sgt. A. J. Marfell.

DIED ON ACTIVE SERVICE.—Flt. Sgt. C. Stovell.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. E. M. Bell; P/O. G. W Coldwell.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. L. Gordon; Flt. Sgt. J. A. E. Romas.

WOUNDED OR INJURED IN ACTION.—Sgt. P. E. Hurtubise.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. J. D. Baird.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. G. H. Corrie; P/O S Danahy; F/O. R. J. Keyes; Sgt. W. V. Wallace; F/O. H. A. Westhaver

MISSING.—Sgt. A. B. Amirault; Flt. Sgt. W. E. Cain; Flt. Sgt. L. W. Clark; Sgt. J. C. E. Dellar; Flt. Sgt. A. M. Horne; Sgt. F. S. Jenkins; Flt. Sgt. P. King; Sgt. J. F. Kirk; Sgt. V. H. Knutson; Sgt. A. F. W. McLeod; Sgt. R. A. P. Sheffield.

KILLED ON ACTIVE SERVICE.—Sgt. R. D. Fattig; Cpl. G. J. Giguere; P/O. D. R. Reid.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Cpl. J. A. G. A. Brouillette; Sgt. D. M. Coates; L.A/C. J. A. T. Rioux; Cpl J. G. A Sevignac; Sgt. J. D Wray.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. J. M. G. Perron.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. L. W. J Hart.

Royal New Zealand Air Force

MISSING, BELIEVED KILLED IN ACTION.—Sgt. R. J Steed.

MISSING.—Act. Sqn. Ldr. W. A. C. Ball; F/O D. F. L. Hardman; Flt. Sgt. D. A Sibbald; Act. Flt. Sgt. S. S. Vinicombe.

KILLED ON ACTIVE SERVICE.—Flt. Sgt N. G. Clark; Sgt. P. K. Norcross.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. J. T. Madsen

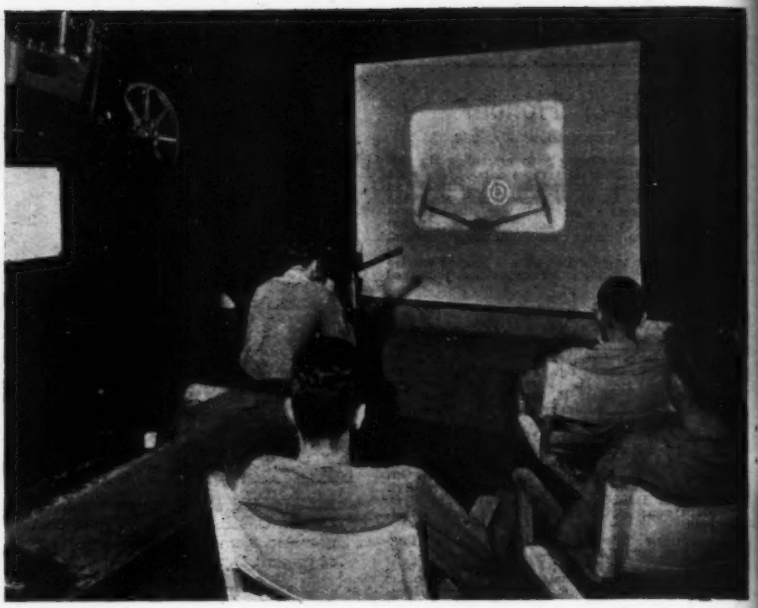
South African Air Force

MISSING.—Lt. M. A. Cotterell; Air Mech. J. A Jones.

Indian Air Force

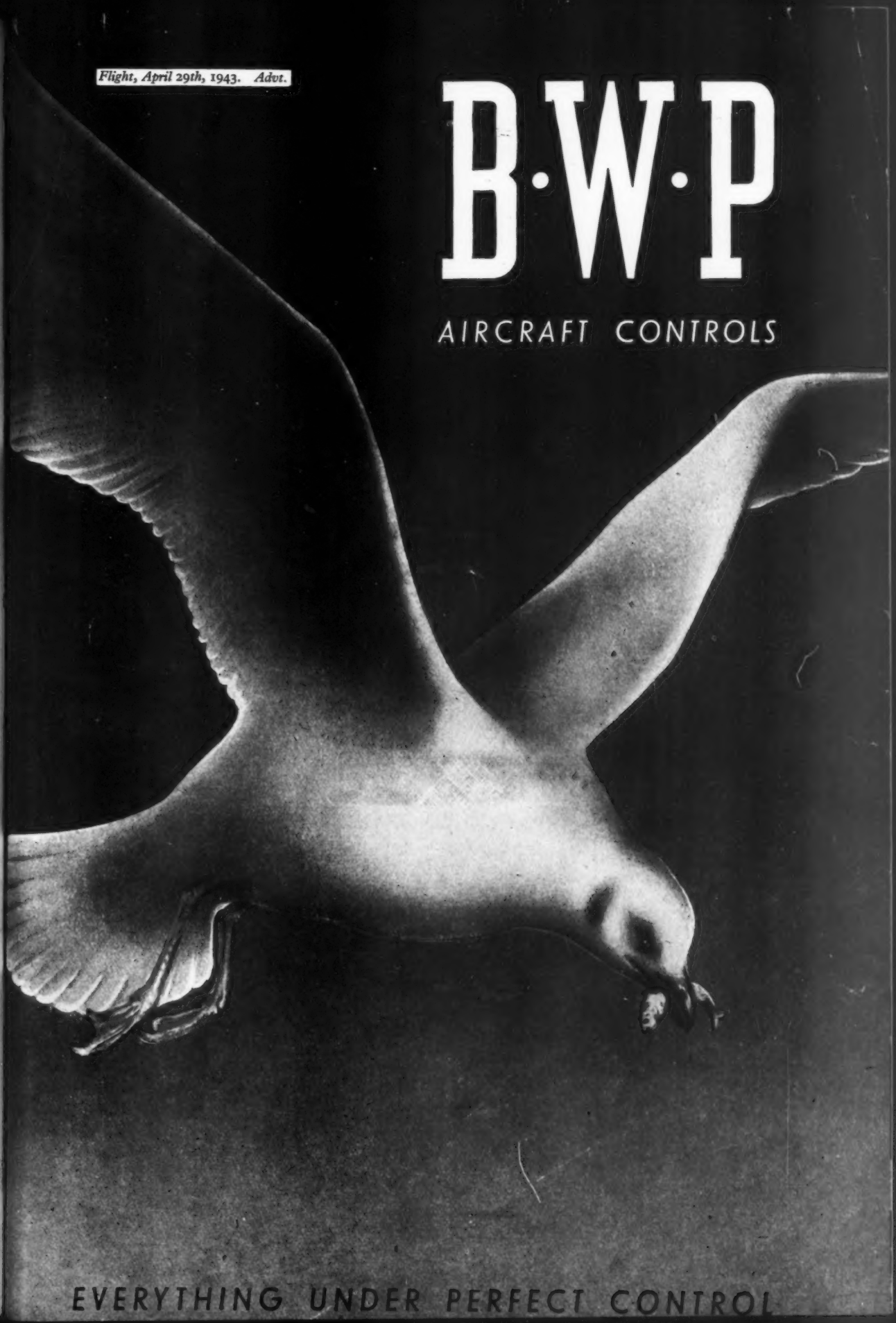
KILLED ON ACTIVE SERVICE.—Act. P/O M. M. H. D. Date.

DIED ON ACTIVE SERVICE.—Ear. Fwr. Manghru Lascar.

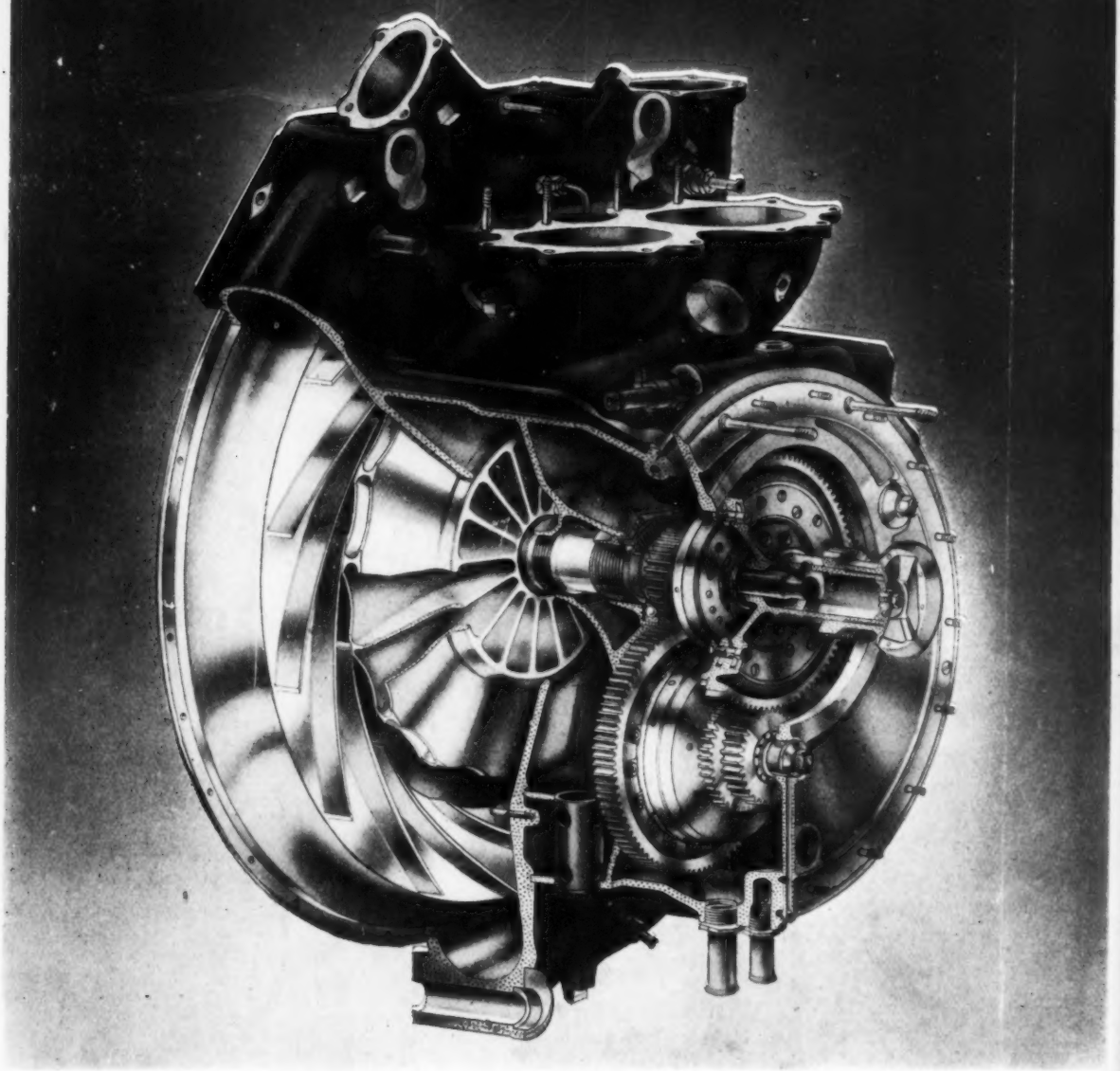


Air gunners training at a U.S. naval air station. The target is projected by a cine apparatus and hits are electrically recorded.

Flight, April 29th, 1943. Advt.



FEATURES OF THE "BRISTOL" HERCULES SLEEVE VALVE ENGINE



SUPERCHARGER

CENTRIFUGAL TYPE, GEAR DRIVEN FROM CRANKSHAFT.

TWO-SPEED RATIOS FOR LOW AND HIGH ALTITUDES.

TORQUE TRANSMITTED BY SPRING DRIVE, THREE DOUBLE-ACTING CLUTCHES AND CENTRIFUGAL CLUTCH.

DIRECTIONAL FLOW OF MIXTURE CONTINUOUSLY MAINTAINED FROM CARBURETTOR TO CYLINDERS.

"British workmanship at its best."

"Bristol"

THE BRISTOL AEROPLANE COMPANY, LIMITED.

Published for the Proprietors, Iliffe Publishing Company Limited, Dorset House, Stamford Street, London, S.E.1, by The Cornwall Press Ltd., 1-6, Paris Garden, London, S.E.1.